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A

SYSTEM OF SURGERY,

BY

J. M. CHELIUS.

TRANSLATED FROM THE GERMAN

BY

JOHN F. SOUTH.

VOL II.

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SYSTEM OF SURGERY,

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DOCTOR IN MEDICINE AND SURGERY, PUBLIC PROFESSOR OF GENERAL AND OPHTHALMIC SURGERY, DIRECTOR OF THE CHIRURGICAL AND OPHTHALMIC CLINIC IN THE UNIVERSITY OF HEIDELBERG, &c. &c. &c.

TRANSLATED FROM THE GERMAN,

AND

ACCOMPANIED WITH ADDITIONAL NOTES AND OBSERVATIONS,

BY

JOHN F. SOUTH,

LATE PROFESSOR OF SURGERY TO THE ROYAL COLLEGE OF SURGEONS OF ENGLAND, AND ONE OF THE SURGEONS TO ST. THOMAS'S HOSPITAL.

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II.—OLD SOLUTIONS OF CONTINUITY.*

A.—ON SOLUTIONS OF CONTINUITY WHICH DO NOT SUPPURATE.

I.—OF UNNATURAL JOINTS.

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Oppenheim, Ueber die Behandlung der falschen Gelenke; in Rust's Magazin, vol. xxvii. p. 203, has collected all the hitherto known cases of treatment of false joints.

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Amesbury, Joseph, Practical Remarks on the Nature and Treatment of Fractures, &c. London, 1831. 8vo. 2 vols.

Seerig, De Pseudarthrosi de fracturâ proficiscente. Regiomont, 1838.

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Brodie, Sir Benj., Clinical Observations on Ununited Fractures; in London Medical Gazette, vol. xiv. p. 676. 1833–34.

Reisseisen, De articulationibus analogis, quæ fracturis ossium superveniunt.

[* Although, as translator of this work, I am of necessity compelled to follow the course which the Author has thought right to pursue, yet I cannot avoid stating, in reference to this division of his Book, that it appears to me improperly named and misplaced, and far from well arranged and composed in itself. "Old Solutions of Continuity, consisting of those which do not and those which do suppurate." Among the former are included enduring solution of parts which have originated in injury, as unnatural joints and torn *perineum*, with original imperfect (or as it is the fashion to say, abnormal) formation of parts, as hare-lip and cleft palate, between which there is neither analogy nor connexion. The latter comprehend ulcers of various kinds, which are as various in their times of appearance, from the period at which the action causing them has been set up—and fistulas, which have really (of the three) the only pretension (slight indeed as it is) to be called old solutions of continuity, as they really are none other than a chronic condition of abscess; that is, an abscess which the constitution has not had sufficient power to fill up and obliterate with new parts, although it is capable of sustaining with less or more effect upon itself, the suppurative disposition already established.—J. F. S.]

[Hartshorne, On Pseudarthrosis, in American Journal of Med. Sciences, vol. 1. N. S.

Norris, On Non-Union after Fractures, in American Journal of Med. Sciences, vol. 3. N. S. Jan. 1842.—G. W. N.]

712. When the two ends of a broken bone, not united by firm cartilage, are covered with cartilage, or the soft parts have got between them, an *unnatural joint* (*Articulatio præternaturalis, Pseudarthrosis*, Lat.; *Widernatürliches Gelenk*, Germ.; *Fausse Articulation*, Fr). is produced. The broken ends in this case are movable, but the natural motions of the joint are greatly interfered with, or entirely prevented.

[On the subject of unnatural or false joints John Hunter (*a*) observes:—"Sometimes simple fractures will not unite at all. This is a worse consequence than any of the foregoing, there being no soft union even, or if there ever was, that being absorbed. Here the surrounding parts thicken and form a kind of capsular ligament, and the extremities of the bone rub against each other at each motion of the limb, by which stimulus the broken parts are absorbed, and the extremities become smooth, and in time are covered with something similar to cartilage, and at length the cavity between them becomes filled with a fluid very much resembling synovia." (p. 504.)]

713. The cause of such unnatural joint may be bad setting of the fracture, improper apparatus, too frequent movements of the limb (1), general disease, and advanced age (*par.* 579) (2). A firm union of the broken ends may also be prevented by particular circumstances under which the bone may be absorbed, and the fractured ends connected only by cartilage. The formation of an unnatural joint depends especially on impeded ossification, on excessive absorption, and the condition of such joint ordinarily presents no actual resemblance to the construction of a natural joint. Frequently, however, the ends of the bone are rounded and enveloped in a thick fibro-ligamentous capsule attached to the ends of the bone, above and below, and its internal surface lined with a smooth membrane, resembling the synovial, and, like it, capable of secretion (Brodie, Gibson, Amesbury) (3). The period at which firm union takes place in fractures is indeed very different (*par.* 578). An unnatural joint may, however, be considered as formed, *if more than six months have elapsed after the fracture, and the ends of the fracture be still movable.* Unnatural joints have been noticed in almost every bone, but they are most frequent in the upper arm.

[(1) Amesbury says:—"By far the most frequent cause of non-union that I have noticed is want of rest in consequence of the inadequacy of the plans of treatment which have been employed. I consider this to have been the primary cause in almost all the cases I have examined." (p. 716).

(2) I do not think advanced age can justly be considered as the cause of want of union or imperfect union, at least as regards the shaft of bones. In almost every ununited or imperfectly united fracture I have seen, the patient has scarcely, if ever, exceeded the middle age, but has generally been younger.

(3) Among the causes of want of union, Astley Cooper believes that it "is sometimes the result of continuing cold applications for too long a period to the part, thus checking that degree of inflammatory action which is absolutely necessary to bring about a restoration of the parts." (p. 679).

Pregnancy has been held to be a cause of want of union, but Amesbury says he has "seen about ninety cases of non-union, but has not met with more than two which happened during the process of gestation. He is therefore disposed to attri-

(*a*) Lectures on Surgery, Palmer's Edition, vol. i.

bute non-union, in persons so circumstanced, more to the inadequacy of the usual modes of treatment than to the peculiar disturbance of the system which is observed in pregnancy." (p. 714).

Sometimes after fracture the union of the broken bone is entirely prevented by one end being dragged from the other by muscular effort; such occasionally happens when the spoke-bone being broken just above the insertion of the *m. pronator quadratus*, its lower end is drawn in by that muscle. Sometimes a portion of neighbouring muscle slips between the fractured ends, and getting free, prevents union. At other times, in a comminuted fracture, a fragment dies and as effectually opposes union as a bullet, piece of cloth, or any other extraneous body is occasionally known to do; and this may happen either in simple or compound fracture. A very good example of an ununited simple fracture from this cause occurred within the last twelvemonth to my colleague MACKMURDO, and was discovered at the operation performed for sawing off the ununited ends. The fracture was of the upper arm, had happened ten months previously, and been kept in splints six weeks, after which it seemed to have united, but in a few days' time was again broken, whilst the woman followed her usual occupation. The splints were reapplied, but without benefit, and afterwards two setons, at some interval of time apart, were passed by the side of the ununited bone, but not between its ends, and worn for some time, but no union resulted. It was then determined to cut down and saw off the ends of the fracture, and when the incision was made for this purpose, the upper end of the bone was found covered with cartilage, and the lower surrounded with a sort of capsule, containing several loose pieces of bone. These were removed and the ends of the fracture sawn off; suppuration continued for some time, and she left the house at the end of two months, the wound not having scarred, and no fixing of the fracture having occurred. Some time after an abscess formed nearer the elbow, and several small pieces of bone have voided by it, and continue so to do. At present, eight months after the operation, there is not any union.—J. F. S.]

714. According to the variety of the cause of unnatural joints, the mode of *treatment* must vary, to prevent their occurrence. If, however, they already be formed, their cure is only possible by the broken ends, which are covered with cartilage, being put in the condition of a recent division, that is, by producing in them a suitable degree of inflammation, which is sought to be effected *by rubbing the fractured ends against each other, by an apparatus of pressure, by the application of caustic, by sawing off the ends*, and *by the introduction of a seton*.

[JOHN HUNTER proposes a different method from either of these. He says:—"In this case it is necessary to lay open the new cavity and irritate the ends of the bones, and then, by keeping them in position, bony union will often take place. It has been recommended to saw off the ends of the bones; but all that seems necessary is, to irritate them sufficiently to excite a fresh inflammation." (p. 505). He does not, however, mention any examples in which either of these modes of practice was successful.]

715. *Rubbing the fractured ends together* (*Exasperatio*, Lat.; *Reibung der Bruchflächen gegen einander*, Germ.; *Frottement des extrémités d'une fracture*, Fr.,) and subsequently fixing them with a suitable apparatus, can only be advantageous during the establishment of the unnatural joint, because afterwards it can seldom produce a sufficient degree of inflammation (1). With the same object it has also been attempted to fix the broken ends by tightly-fitting bandages, for the purpose of exciting inflammation by the patient's standing and walking (2).

[(1) Rubbing the ends of the bone together is at least as old as CELSUS (*a*), as quoted by OPPENHEIM. "Si quando vero ossa non conferbuerunt, quia sæpe soluta sæpe mota sunt, in aperto deinde curatio est; possunt enim coire. Si vetustas oc-

(*a*) De Medecinâ.

cupavit, membrum extendendum est, ut aliquid lædatur ossa inter se manu dividenda, ut concurrendo *exasperentur*, et si quid pingue est, eradatur, totumque id quasi recens fiat, magna tamen cura habita, ne nervi musculive lædantur." *Lib.* viii. c. x. sect. vii.

Boyer considers that this coarse and uncertain practice often destroys a callus when first forming, which by longer continued rest and contentive bandaging might have effected a firm union. Cittadini's case (*a*) of a false joint in the thigh-bone cured by violently rubbing together the fractured ends and by the subsequent application of a contentive bandage, can scarcely be considered to support this practice, as the fracture was only two months old; and, as is well known, many cases unite after as long or longer period of seeming want of union, as completely as under the most favourable circumstances."—J. F. S.]

(2) In cases of this kind I have covered the limb with compresses, and over these applied wet pasteboard splints, so as to enclose it completely; and then employed the usual swathing, with Scultetus's bandage, and the common splints with chaff pads, and having made the apparatus sufficiently tight, have left it for a long while.

716. The use of *Pressure* for the cure of artificial joints rests partly on the close coaptation of the broken ends, and the preservation of complete quiet, and partly on the excitement of a due degree of inflammation. The pressure may be employed either with the usual apparatus of splints, as in recent fracture, and at the same time with padded straps and tourniquets upon the fractured ends (*b*), or by simple strong pressure, with swathing of the whole limb, and graduated compresses with tightly drawn rollers (*c*). These modes of treatment, although many cases prove their good effect, do not, however, frequently effect a cure, because the necessary degree of inflammation cannot be produced, and applies rather to cases of not long standing and to those in which no firm intersubstance is formed.

The repeated application of blisters on the surface, opposite the seat of fracture, has been recommended, at six or eight weeks after the occurrence of the accident (*d*). Cauterization of the skin with caustic potash (*e*), and painting with tincture of iodine (*f*).

[I believe that pressure and perfect rest are the most efficient remedy for fractures in which there is tardiness or indisposition to deposit earthy matter in callus; and I have very great doubt whether firm union is ever effected except when its absence has arisen from this deficiency alone. In simple fracture it can only be surmised what the actual cause of the want of union is, and in operating on such cases it appears quite as often that the diagnosis which has been formed is wrong, as that it is right. It must also be remembered that the deposit of earthy matter in the callus is frequently a very slow process, double and treble the time beyond that ordinarily requisite for the purpose, sometimes elapsing before a fracture is perfectly united. Chelius has just mentioned that an unnatural joint may be considered as formed if more than six months have elapsed after the fracture, and the ends of the fracture be still movable. But Amesbury mentions cases which have united by pressure after six, eight, ten, and even sixteen months have gone by. And therefore I cannot but think that these must only have depended on deficient earthy deposit; for cases have occurred again and again in which pressure of all kinds has been employed without advantage, and when operated upon no callus connexion has been found.

(*a*) In Omodei Annali Universali de Milana, vol. xxxvii. p. 415, 1826.

(*b*) Amesbury, Jos, above cited.

(*c*) Wright's three Cases of Cure of False Joints, by a pressure apparatus; in American Journal of Medical Sciences, vol. ii. p. 270.

Fleury, Des effets de la Compression dans le traitement de plusieurs maladies externes et surtout dans les Fractures et Fausses Articulations, avec quelques réflexions sur cette dernière maladie; in the Mémorial des Hôpitaux du Midi, par Delpech, Sept., 1830, p. 539.

(*d*) Brodie; in London Medical and Surgical Journal, October, 1823.

(*e*) Hartshorne, Philadelphia Medical Recorder, 1826. April.

(*f*) Buchanan, cited at the head of this article.—Trusen, in Preuss Vereinszeitung, Juni, 1834, p. 114.—Willoughby; in Transactions of the Medical Society of the State of New York, Albany, vol. i. pt. ii. p. 76.

That the pressure to be employed in these cases should be sufficiently great and so directed as to bring the fractured ends closely together cannot be doubted, and in fractures which unite slowly is absolutely necessary. But I am not quite sure it is necessary that the pressure should be so great as to produce pain in the course of a few days after the application of the apparatus, as stated by AMESBURY, although "in the different cases it differed very much in degree. In some of them it amounted only to a slight aching pain, accompanied with now and then a lancinating sensation in the fracture; but the inconvenience felt in all the cases varied more or less in the course of the day; and I am not aware that in any one of them it was at any period sufficiently severe to affect the pulse—certainly not so as to produce any noticeable fever." (p. 806).

External irritation in these cases, so far as I have seen, is of little value.—J. F. S.]

717. For the purpose of destroying the cartilaginous surfaces on the ends of the bone, and to produce a suitable degree of plastic inflammation, various kinds of caustic have been employed, strong nitric acid (OLLENROTH) (*a*), caustic potash (the younger CLINE) (1), HEWSON, NORRIS) (*b*), butter of antimony (WEILINGER) (*c*) and nitrate of silver (KIRKBRIDE) (*d*). Here also belong (MAYOR) (*e*) experiments of repeatedly introducing between the ends of the bone a metallic canula, and in it a steel probe dipped in boiling water, and the injection of some irritating fluid into the wound (HULSE) (*f*).

Cases of happy cure of ununited fractures of WHITE, CLINE, LEHMANN, and BARTON, are collected by OPPENHEIM and others in RUST's Magazin.

[(1) CHELIUS has quoted HEWSON as having first proposed the use of caustic potash in ununited fractures. The fact is, however, that it was practised by the younger CLINE more than twenty years before in St. Thomas's Hospital, in proof of which, I copy from my notes the following

Case.—P. M., a sailor aged thirty years was admitted into St. Thomas's Hospital,

April 13*th*, 1815; having on the 7th of September, of the preceding year, fallen down a ship's hold, by which compound fractures of both legs were produced. For these accidents he was received into Chatham Hospital, and there continued till the 1st of March last. During this time the wounds of both legs healed, and the left shin-bone united properly by bone, but the right only by fibro-cartilage. Strengthening plasters and blistering were employed to promote bony union, but without effect.

When first admitted into St. Thomas's, he was directed to walk about for the purpose of exciting the ossific inflammation, but although this was attended with much pain, there was no improvement. Towards the latter end of May, the part was blistered, but without advantage. It was therefore determined to have recourse to an operation, which was performed.

June 12*th*. The skin was cut through on the inner and fore part of the shin-bone, and the connecting substance, which was soiled, being completely laid bare, portions of it were cut away with a small crowned trephine, till the ends of the bone were reached. Into the hole thus formed, caustic potash was introduced, and allowed to remain for a few minutes, after which a poultice was applied. The patient suffered great pain when the intermediate substance was cut into, and indeed was much excited during the whole operation. He had no pain till the evening of the 14*th*, when the leg became very painful, continued so for ten hours, and then became easy. On the 16*th* the pain recurred, and continued for the same length of time, after which it ceased. In a day or two after a free discharge was established, and there was not any return of the pain. On the 21*st* the poultice was left off, adhesive plaster applied,

(*a*) BERNSTEIN, über Verrenkungen und Beinbrüche, Second Edit., Jena. 1819, p. 280.

(*b*) North American Medical and Surgical Journal. Philadelphia, 1838, Jan.

[American Journal of Medical Sciences, vol. xxiii. 1838.—G. W. N.]

(*c*) RUST's Magazin, vol. xxxiv. p. 330.

(*d*) American Journal of the Medical Sci. Feb., 1835.

(*e*) Nouveau Système de Déligation Chirurgicale, &c. 8vo. Geneva, 1832.

(*f*) American Journal of Medical Sciences, Feb., 1834.

and an outside splint put on to support the leg. On *9th of July* he got up and walked about on crutches. On the *20th* he felt that his leg was stronger. On the *27th* he left the house with the connexion of the broken ends decidedly firmer; but the wound was not healed, and he returned again, *Aug.* 17, with the sore still opened. He continued in the house till *Oct.* 10, and then left, at which time the union was complete.—J. F. S.

Hewson's case was successful, and union was complete in twelve weeks after the operation.]

718. *To saw off the cartilage-covered ends of the fracture*, they must be laid bare by a longitudinal cut on that side of the limb where the bone is most superficial, and the large nerves and vessels can be avoided; they are then to be separated from the surrounding and connecting parts, thrust up through the wound, the soft parts protected by a spatula introduced beneath, and first the lower, then the upper portion of the fracture cut off with a suitable saw. The bleeding vessels are to be tied during the operation; the broken ends are to be brought into contact, and the case is to be treated as a compound fracture. In the after treatment, subsequent to the removal of the ends of the bone, it must be especially remembered not to expect too early the consolidation of the ends of the bone, because, from my experience, this occurs only after a very considerable time. I am convinced that, in many cases, amputation of the ends of a fracture have had an unsatisfactory result from want of attention to this circumstance (1).

If the ends of the bone lie very deep and cannot be easily protruded through the soft parts, it is best to use Heine's osteotome. It is frequently very difficult and even impossible to reach that end of the bone which is overlapped by the other end, and surrounded with much soft parts. In such cases it is advantageous according to Dupuytren's experience to saw off that end which can be reached, and bring it in contact with the other which has not been cut off (Pigne). Brodie (*a*), in a case of false joint of the leg, in which seton and pressure had been used in vain, cut upon the shin-bone, removed the half ligamentous and cartilaginous mass with which the ends of the bone were united, scraped both broken surfaces, and filled the wound up with lint. This was left for three or four days in order to fill the wound with granulations, and then pressure was employed to keep the fractured ends in firm and close contact.

(1) In a case of section of an artificial joint in the upper-arm in a young scrofulous man I found the ends of the fracture still quite movable, but complete consolidation ensued two months after under the continued use of the apparatus.

[According to Guido de Cauliaco (*b*), the Arabian physicians recommended cutting down on the fractured part and getting rid of the callus either by rubbing or scraping. "Verum si multum infestitur et aliter fieri non potest, consulet Avicenna incidatur caro et atrosboth (callus) fricando separètur. Si fuerit attritio et timetur membri corruptio, scarpelletur." (p. 45.) This appears, however, from Avicenna's account to have been a very severe and not unfrequently fatal operation.

The operation of sawing off the broken ends of the bone seems to have been first proposed and successfully practised by Charles White (*c*), in 1760, on the upper-arm of a boy, nine years old, which had been fractured six months. In his second case, which was a fractured shin-bone, he could only saw off the upper end, behind which the lower had so fallen that it could merely be scraped, and it was found necessary to introduce butter of antimony, to destroy some muscular fibres between the fractured ends. Both cases did well. This operation has been repeatedly performed, but with very variable success. I think it is only applicable to the upper-arm and leg where the bones are not very thickly covered with muscles; but not in the thigh or fore-arm. Lawrence's observations (*d*) on the subject are well worthy

(*a*) London Medical Gazette, July, 1834.
(*b*) Chirurgia Magna. Venetiis, 1498.
(*c*) Phil. Trans., vol. li. 1760. Also in his cases, above cited.
(*d*) Lectures in Lancet, 1829–30, vol. ii.

of attention. "If the operation be in the fleshy part of the thigh, it must be a very difficult thing to accomplish: you have to inflict a very severe wound, a wound very likely to be followed by considerable inflammation, and that with a still more serious effect. In many instances in which this has been done the patient has at least been left in a worse situation than he was in before." (p. 265.) My friend GREEN's operation on an ununited fracture of the thigh-bone, detailed by AMESBURY (*a*), fully proves the difficulty to which LAWRENCE refers. "A semicircular incision was commenced about the middle of the *rectus* and then carried round through the belly of the *vastus externus*. The flap was dissected back and the fractured end of the upper portion of the bone brought into view. Upon clearing away the muscles it was seen that the two broken extremities of the bone were connected together by a thick dense capsule, resembling the capsule of the hip-joint, the inner surfaces of which were perfectly smooth and shining. The integrity of this capsule was destroyed, by removing a portion of it from the upper fragment; but in consequence of the difficulty which was experienced in getting at the fractured end of the lower portion, which, as has been said, lay on the inner side of the upper, it was left covered with the ligamentous matter. In removing about half an inch of fractured end of the upper fragment, which was done by one of HEY's saws, in order to give room, it was found that the bone had become soft and spongy at this part, apparently from interstitial absorption. From the manner in which the ends of the bone lay, it was evident that the lower portion could not be cleared of the ligamentous deposit which covered it, without enlarging the wound in the soft parts, a proceeding which appeared objectionable." (pp. 821, 22.) The greater part of the wound soon healed without any constitutional excitement, but there was suppuration, and the matter burrowing, an abscess was formed at the upper inner part of the thigh, which was punctured. He was immediately placed on a fracture-bed with inclined planes and no splint applied till the tenth day, when one well padded was put upon the outside of the thigh, and worn for seven weeks, but no union was effected. An inner splint was then also applied and the fractured ends pressed tightly together by the web of a tourniquet twisted closely on them and continued for a fortnight. But no advantage was gained; the limb was amputated above the seat of fracture, and the patient did well. On *examination*, it was found that the unnatural joint "was now again complete. The greater part of it was nearly the thickness of the capsule of the hip-joint, but at one part it was thin like the capsule of the shoulder-joint; the capsule was accidentally torn at this part with the finger, and the inner side was seen smooth, and had very much the appearance of synovial membrane, being moist and shiny. The ends of the bone were rounded, and where they came in contact, were flattened and covered with a dense fibrous structure, very similar in appearance to the intervertebral substance when divided transversely, but especially that part of it which is found half-way between the centre and circumference." (p. 826.) It appears to me, in regard to this case, that if WHITE's treatment had been followed out and the ligamentous covering of the lower end of the bone had been destroyed with caustic, the result might probably have been more favourable. As it was, the object of the operation, to wit, that of getting rid of the ligamentous or cartilaginous coverings of the fractured ends, was only partially effected.—J. F. S.]

719. The *introduction of a seton* is to be effected in the following manner:—It should be attempted by extension and counter-extension to bring the broken ends into proper position, and even to separate them somewhat from each other. With due caution the place is to be chosen, where the seton-needle armed with silk can be so thrust into and through the whole limb, that no large vessel nor nerves should be wounded, and so that the seton thread be placed between the two ends of the fracture. It might be better, perhaps, in most cases, to cut down on both sides to the bone, for the purpose of more certainly and accurately carrying the seton through between the fractured ends. The limb should then be duly extended, and kept in proper position by a suitable apparatus. The seton-threads are to be drawn daily backwards and forwards be-

(*a*) Above cited.

tween the fractured ends, and to be entirely removed as soon as the ends are found to be knit together. If, after three or four months, no firm union have ensued, all hope of cure must be given up; there remains then, if the patient will be relieved of the inconvenience of the unnatural joint, no other remedy than amputation.

Weinhold (*a*) himself employed with advantage his needle-trephine, with which he introduced a wedge-shaped seton smeared with some irritating matter.

Oppenheim (*b*) recommends, in order to make the operation of the seton more powerful, enduring and effectual, where the circumstances previous to the introduction of a seton had not promised, *à priori*, any result, the introduction of two setons, not indeed, as already proposed, through the newly formed cartilaginous intermediate mass, but in such way that each seton should be in contact with one of the fractured ends; the setons not to be left too long, but only till such time as suppuration was properly established, and then at once withdrawn, instead of by repeated and gradual thinning the size of the seton. In two cases Oppenheim pursued this practice with success under the most unfavourable circumstances.

According to Jobert's opinion (*c*), the seton should be left in only eight days.

720. The use of the seton may be accompanied with difficulty and danger, when in an oblique fracture the surfaces of the fracture correspond, so that in passing the needle through, important vessels and nerves may be injured. If the fractured ends be so close together that their surfaces touch only at one little point, the proper position of the bone must be first attained by permanent extension, after which by the introduction of the suture, some advantage may be gained.

721. The introduction of the seton is more simple and less dangerous than sawing off the ends of the fracture; healing also takes place without shortening of the limb; but in many cases, on account of its less activity, it is not beneficial, as when the ends of the bone are united by a wide mass of cartilage, or by an actual false joint. The seton should be left for a long time, for four or five months, even to the consolidation of the bone (Physick). Smearing the seton-thread with irritating ointment, for the purpose of strengthening its operation, may easily excite erysipelatous inflammation, abscesses, and constitutional irritation. The symptoms after sawing off the fractured ends may be very dangerous. Great inflammation, suppuration, and gangrene may occur, and these may even proceed to a fatal result.

In the thigh the section is always effected with great difficulty, and much danger; it has, however, been there performed with success (*d*); in limbs which have two bones the section has been considered impracticable; Fricke (*e*), however, and Cittadini (*f*), have performed it successfully on the fore-arm. Opinions as to the preference of the seton or of the section are very much divided; by both one as well as by the other mode of treatment, fortunate and unfortunate results have taken place; and equally celebrated surgeons have held with the one and against the other practice (*g*).

(*a*) Von der Heilung des falschen Gelenkes, u.s. w.; in Hufeland's Journal, May, 1826.

(*b*) Hamburg Zeitzschrift.

(*c*) Archives Générales de Médecine, 1840, Octobre, p. 224.

(*d*) Medico-Chirurg. Trans., vol. ii. p. 47.

(*e*) Oppenheim, above cited, p. 242.

(*f*) Ommodei, Annali universali de Medicina, Marzo, 1826, p. 411.

(*g*) Note the comparison of the cases of the one and other mode of treatment by Oppenheim and Norris.

Ballif, Apparat zur fixirung der falschen Gelenke. See Troschel, Dissert. de Pseudarthrosi. Berlin, 1826.

Somme, on the Cure of a False Joint by the introduction of a silver loop and extension apparatus; in Med.-Chir. Trans., vol. xvi. p. 36.

[As far as my own observation and experience are concerned I cannot say that there is great encouragement for the performance of any operation for ununited or imperfectly united fracture, and I think a comparison of the results of the numerous cases which have been variously treated will confirm this opinion. The most favourable cases are those in which the ends of the bone are connected by cartilage or a cartilage-like substance, and in such I should certainly prefer the introduction of caustic potash. The least favourable cases are those in which the fractured ends have acquired a cartilaginous covering and are enclosed in a sort of synovial capsule, which indicates a total indisposition to the formation of callus; and therefore cutting off the ends, or scraping off their thin cartilaginous covering, is a very doubtful proceeding, as union will commonly not occur and the fractured ends be re-covered, as in GREEN'S case. Perhaps, where the union is prevented by loose pieces between the ends of the broken bone, if these be removed, union may take place; but that this is very uncertain is proved by MACKMURDO'S case.

The great difficulty to contend with, in determining on the performance of any operation with the reasonable hope of success, is the almost utter impossibility of distinguishing the real cause of the want of firm union, which can only be ascertained when the fractured part is exposed; and which very frequently disproves the diagnosis previously made. I think therefore that it is advisable in all cases of ununited fracture in which operations are performed that the surgeon should fairly warn the patient of the great uncertainty of their result and leave him to determine for himself.—J. F. S.]

II.—OF HARE-LIP.

(*Labium Leporinum*, Lat.; *Hasenscharte* Germ.; *Bec de Lièvre*, Fr.)

HEISTER, L., De Labio Leporino. Helmst., 1744.
LOUIS; in Mémoires de l'Académie de Chirurgie, vol. iv. p. 385.
LOCHER, De Operatione Labii Leporini. Jenæ, 1792.
FRETER, De modis variis quibus Labium Leporinum curatur. Halæ, 1793.
CELLIER DE CLERMONT, De la Division Labiale. Paris, an XI.
RIEG, Abhandlung von der Hasencharte. Frankfurt, 1803.
DESAULT, Œuvres Chirurgicales, vol. ii. p. 173.
RAU, J. D. L., Dissert. de Labio Leporino cum proëminentiis Maxillæ Superioris complicato. Berol., 1818.
CASPAR, C. R., De Labio Leporino. An IV. Goetting, 1837. 4to.; with engraving.
METTAUER, JOHN P., M. D., On Staphyloraphy; in American Journal of Medical Sciences, vol. xxi. 1837.
DEMONCY, C., Dissert. de Labio Leporino. Mosquæ, 1839.

722. The *hare-lip* is a division of the lip upon which the red edges are continued. It is always a vice of the original formation, though an old division of the lip may be consequent on external violence, if the edges of the wound have not united, but have skinned over. In the former case the edges of the cleft are smooth, and overspread with a delicate epidermis; in the latter irregular and callous. The hare-lip is always in the upper lip. The lip may be either partially or completely cleft, and is often accompanied with a cleft of the upper jaw and palate (*Wolf's Jaw; Palatum fissum*, Lat.; *Wolfsrachen*, Germ.)

The cleft is sometimes simple; frequently is there between its edges a larger or smaller middle piece. Bony processes often project into the cleft, or in adults the teeth protrude between the edges. Only when the hare-lip is connected with a cleft in the bone does it hinder children from sucking (1). In adults the speech, especially the pronunciation of the labial letters, is always indistinct in hare-lip.

[(1) This is commonly stated, but is not always so; the gap in the jaw and palate of course is a great obstacle to sucking, but it does not entirely prevent it, and the infant manages to acquire a compensation for a seeming want of which it was not aware.—J. F. S.]

723. Hare-lip, when an original vice, is an arrest of the development of the lip; as is wolf's jaw, of that of the jaw-bone. Both of them usually occur on the left side, whilst the right is naturally formed. When the cleft in the lip and jaw-bone is double, that is, running into each nostril, they are often separated at the underpart of the nasal partition by a projecting piece of bone which contains more or less incisive teeth (*Double Wolf's jaw, doppelter Wolfsrachen.*) In several cases of hare-lip and cleft palate the olfactory nerves have been observed to be wanting (1).

[(1) I have been obliged to alter this paragraph very considerably, as the description given by CHELIUS is very obscure and not quite correct.—J. F. S.

PIGNÉ (*a*) has very properly stated, that "an acquired hare-lip may affect indefinitely all kinds of direction and position; but that the congenital form is always perpendicular to the free edge of the lip, and but *very rarely* met with in the mesial line."]

724. Hare-lip can only be *cured by operation*, which consists in removing the edges of the cleft with the *bistoury*, or with *scissors*, and uniting the fresh cleft. This is easy in proportion as the cleft is simple. If the palate be at the same time cleft it frequently closes after the cure of the cleft in the soft parts, but it may continue during the whole life. Although experience has shown, that the operation may be successful in very young children, it is, however, best to delay it till eight months (1). Only when wolf's jaw is connected with hare-lip, and the child cannot suck, may the operation be undertaken within the first six months (2). In children of two years the operation may be delayed till they have become intelligent. The previous drawing together the edges of the cleft with sticking-plaster or bandage, with a view to its more speedy union, is useless; but it may be advantageous in accustoming the child to the dressing. If there be a bony growth in the cleft it must, after the skin covering it has been raised, be removed with the nippers, and the bleeding having been stanched, the skin which has been preserved must be used for covering the *septum*. If the incisive teeth project, they must be extracted, if of the first set; but if of the second it must be attempted to give them their proper direction by continued pressure, and if this be not possible they also must be extracted (3). Previous to the operation the child should be kept awake a long time (4).

[(1) LAWRENCE thinks "it is very desirable to remove the defect early on every account; in my opinion it is also advantageous as respects the success of the operation, that it should be performed at a comparatively early period. I should say, then, that in the third, fourth, or fifth month after birth it should be performed, at all events, you should perform it at such a period that it will not interfere with the process of dentition. There is often a good deal of irritation going on in the neighbourhood of the part which is the seat of this defect at the time of teething, so that it is desirable you should accomplish the cure before dentition commences, or put it off till after the child has got its teeth; it is, however, in my opinion, desirable to perform it before. It so happens that I have had, at various times, under my care a great number of cases of this kind; I have invariably performed the operation at the time I have mentioned, and I have not, in any one instance, seen an unfavourable result from it considered as an operation, nor a failure of the ultimate object of the

(*a*) In his Translation of this Work.

operation, that is, the closure of the preternatural fissure. It has sometimes been said that children are liable to convulsions at this time, and that a considerable loss of blood may act seriously on them, so that they may die from the mere effect of the operation. This has not occurred in any case that has come within my observation." (p. 819.)

Mütter says :—"If called a few days after birth, and the child is healthy, I operate for the hare-lip as soon as possible, believing as I do that the earlier the operation is performed the better. Much needless dread of convulsions, sloughings, fevers, &c., exists in the minds of some when they refer to operations of this kind upon very young children, but I have over and over again succeeded, without the occurrence of an untoward symptom, in infants of three, four, and five days old." (p. 25.)

(2) I do not think even eight months is sufficient age for the performance of this operation. Some surgeons, as just mentioned, do not hesitate to perform it at six weeks or a month, or even at a shorter period after birth. But it is objectionable, because sometimes the child's crying more or less tears the new adhesions, and an ugly notch remains in the lip; or, what is still more important, it produces dangerous fainting from the loss of blood, or subsequent convulsion, which are only checked by the removal of the threads, and allowing the original gap to be reproduced. It should not therefore be lightly undertaken in very young children, as it exposes them to much danger. I would never perform it before two years old ; but if the parents can be persuaded to wait till the child is six or eight, it is preferable, as the lip being thicker and larger, and the child being capable of understanding the advantage of keeping quiet for a few hours, the operation is more successful, and a better and more even lip is formed.

(3) Whether the teeth be of the first or second set, if they stick out much, there is little hope of bringing them into proper place by pressure, and it is therefore better to remove them, which should be done a day or two previous to the operation.

(4) As to keeping the child awake for some time before the operation, it is not matter of much consequence; for in general he will soon drop off to sleep.—J. F. S.]

725. The operation is to be performed in the following manner:—The child is to be held by one assistant, with his legs between his, and the child's hands within his. A second assistant presses the child's head against the breast of the former; and with his hands placed on each side beneath the jaw, at the same time he brings the skin of the cheeks somewhat forward, and compresses the facial arteries. The head of the child is always to be inclined a little forward (1). If the lip be united with the gum it must first be separated to a *sufficient extent* with a curved bistoury.

The surgeon takes hold of the lower angle of the left edge of the cleft part with the finger and thumb of the left hand, or with a pair of forceps, and drawing it towards him, thrusts the blunt blade of a strong *pair of scissors* (2), curved at an obtuse angle on their outer edge, under the lip, and so high that the point reaches above the angle of the cleft. He then pushes the scissors a little upwards, and cuts off lengthways the whole red part of the cleft lip. Next with the thumb and finger of the left hand, he takes hold of the lower corner of the right side of the cleft, and operates on it in the same manner, with his hands crossed. Both cuts must unite closely with each other above the angle of the cleft. If the cut be not perfected at once, it must be continued in the same direction, and without stretching too much the already divided part.

[(1) The position of the child's head is a matter of no slight importance; for if laid on the back, as often carelessly done, or if not so placed as to favour the streaming of the blood from the mouth, it will run back into the throat, and produce violent coughing and even choking.—J. F. S.

(2) Lawrence considers that "the scissors are the most convenient mode (of per-

forming the operation for hare-lip) and that you will do it best with that kind which have knife edges; * * * they cut with great facility, without bruising the edges between the blades, and such scissors are the most convenient for paring off the edges of a hare-lip." (p. 819.)]

726 In using the *bistoury* the lip should be fixed upon a piece of wood introduced beneath it, or, still better, by BEINL's lip-holder (*a*), of which the one blade of cork or wood placed beneath the lip, is to be carried so high that both blades rise above the angle of the cleft, and when closed leave about half a line of the naturally conditioned skin, together with the red edge of the cleft uncovered. The bistoury is then thrust in a line above the angle of the cleft, and its edge being applied, beneath, is drawn down along the side of the upper blade, so that the whole edge of the cleft is cut off. The second edge is to be treated in like manner, the knife being introduced at the point where the first cut was commenced (1).

[(1) The bistoury is certainly preferable to scissors, which bruise the parts they divide. But I think our common mode of using it, is better than that recommended by CHELIUS; and a phimosis knife the most convenient and the only instrument required.

The surgeon should grasp either corner of the cleft lip which he fancies most convenient, with the finger and thumb of his opposite hand, and then passing the point of the knife behind the lip, he thrusts it through about a line above the angle of the cleft, draws it down till it has cut through the red part of the lip, taking care to cut off the whole piece which, entering into the cleft, rises above the proper level of the lip, for unless this be attended to, an ugly notch remains after the union of the wound. The other edge is afterwards to be pared in like manner. There need be no fear of freely cutting away the lip, as the edges always readily come together, and if they seem to need any dragging at the upper part to effect this it is better to divide the neighbouring membrane of the mouth, to prevent such drag.—J. F. S.]

727. The bleeding is generally inconsiderable, and stanched by the close junction of the fresh-made edges, which is best effected by the *twisted suture*. For this purpose gold or silver needles are used, with steel points which can be removed (1). The left edge of the lip is to be held with the thumb and finger of the left hand, and the needle thrust vertically through near the red edge of the lip, and from three to five lines distant from the edge of the wound, to the lining membrane; it is then to be brought horizontal, so that by pressing, its point appears near the edge of the lip in the surface of the wound. The other edge of the wound is now to be brought with the fingers of the left hand to that already pierced, and the needle introduced in the same direction and made to pass through externally. The point of the needle is now to be removed, a thread applied around it, and its ends drawn down by an assistant. At two or three lines' distance from the former a second needle is to be introduced, whilst with the thumb and finger of the left hand its point is pressed against the right edge of the wound. If the cleft be large, the employment of a third or fourth needle may be necessary. A stout thread is then to be twisted around each needle in form of ∞, first upon the upper pin, and then on the others, and to be sufficiently drawn till the edges of the wound are brought into close contact. The ends of the thread are to be tied in a slip knot; and care must be taken that the threads should regularly and closely cover every part of the wound. Beneath the ends of the needles pieces of sticking plaster

(*a*) Beobachtungen der Chirurgischen Academie zu Wien, 1801, vol. i. pl. ix.

should be put, for the purpose of preventing their digging into the skin. The union is to be supported by strips of sticking plaster with their ends cleft, their middle being placed on the nape of the neck, and the cleft ends carried beneath the ears over the cheeks, which are to be pressed forwards, continued in the interspaces of the needles, crossed and fastened upon the opposite sides.

Dieffenbach, instead of the common pins for twisting the threads upon, employs the most delicate Karlsbad insect-needles, which he separately envelopes in thread, and cuts off the two ends of the needle with scissors (2).

As regards the result of the operation, it is nearly the same whether the edge of the cleft be removed with the bistoury or with scissors. In thick, puffy, and irregular edge, the bistoury is always preferable. The union of the cleft by the twisted suture and sticking plaster is most preferable, as the interrupted sutures, recommended by some, do not produce so close union, and the threads easily tear out. The uniting bandages and dressings of Richter, Stückelberg, and others, are easily displaced. Mayor (*a*) pierces the left edge of the wound near its free end with a needle, which he introduces at a right angle from within outwards, drawing with it a double thread, at the end of which a ball of cotton is attached; by its pressure the edges of the wound are united, and, by tying together the ends of the threads upon a ball of wool put between them, the union is supported probably as well as in the seam suture.

[(1) "It has usually been the practice," says Lawrence, "to employ two hare-lip pins, (consisting of a hollow silver cylinder with a steel point,) and to put one just at the point where the red part of the lip joins the external integuments, and another near the upper angle of the wound; but in performing the operation on the young subject at the age I have mentioned, and I have always performed it thus early, I have invariably found it sufficient to use a single hare-lip pin, introducing it at the lower part of the fissure, near the red portion of the lip, and to unite the wound at the upper angle with a simple suture. * * * Having introduced the pin, I take out with the forceps the steel point, the silver part only being left in its situation. * * * Then having secured the pin with two or three turns of the silk, you can put in the simple suture. * * * You do not put any thing further over the wound, there is nothing wanted, in fact; you leave the wound, and find that you can remove the pin and cut out the simple ligature placed above it, about the fifth or sixth day, when you will usually find the fissure completely united." (pp. 819, 20).

(2) The thin insect-pins recommended by Dieffenbach are much the best kind of pin for this operation; and the thinner they are, if they will only bear the necessary pressure for their introduction, the better, as they leave a proportionally smaller scar. I generally use three pins. The application of strips of sticking plaster is as unnecessary as it is irksome.—J. F. S.]

728. After the operation the child is to be laid a little on one side, and attention paid to the continuance of the bleeding (1); he should be soothed as much as possible, and the food should be given only at the corner of the mouth. If he cry much, some *syrupus opiatus* should be given. The dressings must be cleaned daily with luke-warm water from the mucus flowing from the nose, and the needles smeared with oil. On the fourth day after having removed the plaster and cleansed and oiled the needles, they are to be removed, the upper first, and afterwards the lower, during which the lip is to be held together with the fingers of the left hand, sticking plaster must be applied till the wound is perfectly consolidated (2).

[(1) Bleeding after the edges of the wound have been applied and fixed with the pins and threads is of very rare occurrence; indeed I have never known it happen. As no plaster should be used, scabs very quickly form on the wound and about the

(*a*) Nouveau Point de suture pour l'opération du Bec de lièvre; in Gazette Médicale de Paris.

threads, which are best left alone. If there be any oozing, or if drivelling from the nose, it may be gently mopped with a piece of soft linen, but as little as possible.

(2) The time recommended by CHELIUS for leaving the pins in is too long; thirty or forty hours at the utmost is amply sufficient, and sometimes even less; for so soon as pus is observed about the needles it is proper they should be withdrawn, as they then cease to be of use, and only cause irritation; and this occurs more or less quickly according to the powers of the constitution.

In removing the pins it is best to draw them gently through each coil of thread with a pair of stout dressing forceps, supporting the wound at the same time with the finger and thumb; and after their withdrawal the thread should be gently picked off with the finger-nail or with a probe. The upper two pins and threads should be first removed, and a long strip of plaster carried across the lip from ear to ear, which done, the lower pin and thread are to be taken away. The plaster may be reapplied two or three times daily or every second day, but its use is rather precautionary than necessary.—J. F. S.]

729. If much inflammation of the wound occur after the operation, the threads, if too tightly drawn, must be loosened, and lead wash applied. Cramps and convulsions require narcotic remedies. If the needles tear out, the union must be again restored by the twisted or interrupted suture (1); or if the separation of the edges of the cleft be partial, the union must be assisted by the continued application of sticking plaster. This is, indeed, best in the first instance, because the needles introduced through the *inflamed* edges of the wound again tear out. The needles are most certainly prevented tearing out if they are passed in and out from the edge of the wound, and not left in more than three days.

VAN ONZENORT's advice is to pass the needle on each side of the wound through pieces of leather, to prevent the tearing away.

[(1) If the needles tear out, an accident which I have never known to occur, I think it would not be advisable to reintroduce them, as there could be no more probability of union occurring than in a torn wound, and their presence would therefore only increase the irritation. It would therefore be best to leave the parts alone, and to repeat the operation at a future opportunity.—J. F. S.]

730. In double hare-lip, when the middle piece is sound and large, the edges on both its sides must be pared and the needle passed through the edges of both cleft and middle piece; but if it be small and crumpled it must be removed. If the cleft pass into the nostril, the lip must be separated from the gum equally high, the upper part of the cleft freely pared, and the upper needle introduced as high as possible (*a*).

731. Nothing has been done towards the union of the cleft in the hard palate. It has been recommended to make continued pressure on both upper jaw-bones with a stirrup-like apparatus (1). If nature do not close these clefts, the inconvenience may be diminished (*b*) by a sponge introduced into it and fastened upon a silver or leather plate.

[(MÜTTER, who advocates early operating on cases of hare-lip and cleft palate, mentions, among the advantages of so doing, that "the influence exerted by the pressure of the cheeks and lips upon the maxillary bones is sometimes sufficient of itself to cause an entire closure of the fissure in the hard palate. We have thus, when the patient grows up, only the cleft of the soft palate to contend with." * * * After the lip has entirely healed, I have derived much advantage from causing the nurse to introduce her finger and thumb as far as possible into the mouth between the cheeks and alveolar processes, and make lateral pressure upon the latter several

(*a*) FRORIEP's chirurgische Kupfertafeln, pl. CCXXV. CCXXVI.

(*b*) DIEFFENBACH's proposition; in HECKER's literarische Annalen, July, 1827.

times a day. I have also resorted, in very bad cases, to a small silver clamp, composed of two flat blades and a regulating screw. The blades being properly adjusted, one upon each side, the screw is gently turned so as to produce the requisite degree of pressure. If called to a child a few years old, affected with hare-lip and a cleft palate, we have no time to lose, and should operate on the lip at once. Even in these cases I have seen quite a wide cleft closed by the action of the cheeks aided by the silver clamp." (p. 26.)

(2) As to the use of obturators, I think MÜTTER's observations are well worthy attention. "It is highly improper in these, as well as in all other cases of the defect in young children, to use an *obturator fastened by means of a sponge*, as the foreign body effectually prevents the closure of the opening. An artificial palate, fastened to the teeth or gums, by preventing the passage of food into the nostrils, will, on the other hand, prove exceedingly useful, as well as a source of decided comfort to the patient." (p. 27.)

Operation for Cleft in the Hard Palate.

METTAUER has proposed and practised successfully; as has also MÜTTER, a mode of *Staphyloplasty* by granulation, as the latter calls it, in cases "where there is a separation of the margins (of the fissure in the hard palate) to an extent which will not allow them to be approximated. * * * The first operation contrived by us in a case of this description, consisted of a series of incisions more or less extensive, formed exterior to the margins of the cleft and parallel with them, extending from the faucial to the nasal surface on both sides. These incisions being designed as granulating surfaces, were not allowed to re-unite by the first intention, but kept apart by interposing between them small portions of buckskin or soft sponge, there to remain until suppuration should be well established and then to be removed. Incising from the supporting portions of the lips of the cleft a belt more or less wide and supported at each extremity by the natural continuity of the textures through which they may be nourished by blood, enables us to create an extensive surface for eliciting and rearing of granulations without the least hazard or danger of disorganizing the parts separated or their respective lips. In this condition they take on inflammation, which speedily terminates in suppuration; and granulations soon sprouting out from these newly created surfaces, fill up the incisions by which they are separated, and thus widen the lips to a greater or less extent. The first incisions are to be most extensive; and as the lips are expanded they should be less so, or the cicatrices may ulcerate or become disorganized and slough. The newly formed parts cannot be safely incised until perfectly organized. It would be most safe to perform the succeeding sections exterior to the cicatrices and in the original textures, as they granulate most readily and freely, and are not liable to ulcerate or slough. Should the parts be deficient in length, the method which we have been describing may be employed in a transverse direction guided by the views just submitted, but not to divide the *tensor palati* muscle. * * * Cures by this method must necessarily be tedious, and the time required for their accomplishment more or less protracted, as the cases are distinguished by fissures of greater or less extent, or lips thin or the reverse." He therefore proposes another more expeditious operation, which "consists in making the sections of the lips of the cleft oblique instead of perpendicular, as in the preceding operation; and as it were to divide or split them, so as to separate the nasal from the faucial portions of the lips. This method unites the advantages of the flap and granulating process. * * * The surgeon commences the operation by denuding the margins of the lips of the fissure, as already described. As soon as the bleeding ceases, an incision is to be commenced in one of the lips, a little exterior to its margin and a few lines anterior to its uvular verge. The marginal incision on the faucial surface should commence nearly a line and a half or two lines from the margin of the lip. At this point, the knife is to be inserted and directed in such a manner as to cut the lip obliquely from a line continued from the point of its insertion parallel with the margin of the lip to the angle, to another line passing in or near the base of it on its nasal surface, thus forming the section in the diagonal between these points of the faucial and nasal surfaces of the lips of the cleft. * * * It will always be found most convenient to dissect from the *uvula* upwards, as by that means the blood, which otherwise might essentially perplex and embarrass that step, will, in some degree, be avoided.

These incisions should always extend a few lines above the angle, and must never be carried nearer than two or three to the uvulal margin of the lip of the cleft." The section of the opposite lip is to be performed in the same way, as soon as the bleeding from the first has ceased. "The ligatures must be now introduced, and with as little delay as possible, or the lips may become so tender as to render their application exceedingly painful; and should much time be delayed, even dangerous. For this purpose the canulated needle-porte, armed as already directed, should be employed. * * * The sutures are in these cases to be inserted a little interior to the margins of the labial cuts on their faucial surface, so as to permit a belt of the natural covering of each lip of the cleft to be interposed between the denuded margins and the incisions, and embraced by the noose of each of the sutures. * * * Under no circumstances will it be prudent to begin the insertion of the sutures of the lips elsewhere than at the angle of the cleft. Although we have described this mode of operating for cleft palate, as if executed upon the lips of the fissure their whole length, it is not to be inferred that we advise the measure in every case. On the contrary, this will seldom be safe, especially when the fissure is very extensive. The sections may be formed as we have described them, the whole length of the lips of the cleft, but it will not be safe to attempt to insert ligatures, at the first operation, to more than a third or half of the margins thus incised. * * * After the margins of the denuded and incised lips have been approximated and firmly united at the median line of their contact, and sufficient time has been allowed for the subsidence of the several traumatic, irritative and inflammatory movements, as well as for the consolidation of the union of the parts involved in the operation, the remainder of the cleft may be closed in the same manner, only extending the diagonal section now quite through the uvulal margins, which, after they are approximated in the line of the fissure by the suture, but not confined in close contact, may themselves have sutures applied on their posterior margins, merely to prevent the displacement of the cut edges, and to keep the surfaces in contact as far as they are opposed to or overlap each other. * * * This operation will be equally applicable when the fissure extends entirely through the palatine and alveolar processes of the superior maxillary bone, with or without a division of the lip, and when the margins of the cleft, as is usual in such cases, are permanently separated. But when the lip is involved and the case complicated with hare-lip, staphyloraphy as well as the operation for this last infirmity, will be demanded. In such a complication the long cleft must be first connected, as the parts then will be more easy of access to the operator, and the operation more easily executed while the division of the lip remains open; after the long cleft is closed, the operation for hare-lip may be performed at once, or after the cure of the fissure is perfected. * * * As soon as the union between the lip has become firm, the sutures may be cut away; generally on the sixth or seventh day, the first nearest the angle may be removed; and on alternate days, as shall be found safe, the remainder may be removed." (p. 325–31.)

In a case of chronic mercurial disease in which there was an oval opening three-fourths of an inch in length by nearly half an inch in breadth, on the right side of the roof of the mouth, through which the finger might be readily passed into the nostril of the same side, but in which the *velum palati* was barely involved, Mütter successfully practised Warren's operation of sliding the flap modified so as to embrace the operation by granulation of Mettauer."* * * With a small thin convex-edged bistoury he made a crescentic incision through the mucous membrane, and down, in fact, the bone, commencing the incision nearly opposite the superior extremity of the opening, and continuing it until it reached a point nearly opposite its inferior. A strip of mucous membrane, about three lines and a half in breadth, was thus separated, except at its extremities, from the adjacent parts. A similar incision was then made on the opposite side. The lips of the little wound were then detached from the subjacent bone to the extent of one line on each side, and then folded, as it were, upon themselves, thus leaving a gutter, into which he inserted a small cylinder of soft buckskin. * * * Inflammation followed by suppuration speedily supervened, and on the removal of the cylinder, seventy-two hours after its introduction, a fine crop of healthy granulations was discovered at the bottom of the wound; these rapidly increased in size, and soon filled up the space between the lips of the incisions, rendering the introduction of any foreign body for the accomplishment of this object needless. In six days after the first operation, and when the granulations were in full vigour, I performed the second series of in-

cisions, which were carried between the extremities of the other two, and treated in precisely the same manner. In six days from the execution of this second operation I found the opening in the palate surrounded by a strip of granulations, and in a proper condition for the last and by far the most difficult step in the whole attempt, the detachment and approximation of the flaps. * * * I commenced by detaching the mucous membrane all around, dissecting from the margins out to the granulations, which being very yielding, allowed me without difficulty to bring the flaps together at or near the centre of the opening. To accomplish this a pair of small forceps was employed, and while the flap was held tense by an assistant, I passed the ligature first through the flap on the left side, at its centre and about a line from its edge, and then allowing that to escape from the forceps, the opposite one was made tense and the ligature passed through it at a point directly opposite the little wound in the other; the ligature was then tied, and the flap above, or that next the anterior portion of the mouth brought into the concavity formed by the approximation of the two lateral flaps, and attached by a ligature on each side. The lower was next brought to its proper position, and there held by similar stitches. The opening in the palate was thus completely covered in. The usual after-treatment was pursued, and in three weeks from the date of the last operation my patient was perfectly relieved of every vestige of his deformity. The ligatures were cut away on the fourth, fifth, and sixth day, and nothing of consequence occurred during the period of confinement." (pp. 21, 2).

III.—OF THE CLEFT IN THE SOFT PALATE.

(*Fissura Palati Mollis* Lat.; *Spalte im weichten Gaumen* Germ.; *Division du Voile du Palais*, Fr.)

Graefe, Die Gaumen-Naht, ein neuentdecktes Mittel gegen angeborne Fehler der Sprache; in Journ. für Chirurg. und Augenheilk, vol. i. p. 1, and p. 556.

Stephenson, Dissert. de Velosynthesi. Edinb., 1820.

Doniges, De variis uranoraphes methodis Aphorismi. Berol., 1824. 8vo.

Ebel, Beiträge zur Gaumen-Naht; in v. Graefe and v. Walther's Journal, vol. vi. part i. p. 79.

Wernecke, Ueber die Gaumen-Naht; ib., p. 102.

Roux, Mémoire sur la Staphyloraphie, ou Suture du Voile du Palais. Paris, 1825. 8vo.

Dieffenbach, Vergleichende anatomische Untersuchungen über den Gaumen-Segel; in Hecker's literarischen Annalen.—Beiträge zur Gaumen-Naht; ib., Febr,. 1826, p. 145; July, 1827, p. 343.

Schwerdt, F., Die Gaumen-Naht; a description of all the various methods and the instruments known to have been used in, up to the present time; with a preface by v. Graefe and four copper-plates. Berlin, 1829. 4to.

Velpeau, Nouveaux Elémens de Médecine Opératoire. Paris, 1832. 8vo.

Hosack, A., Memoir of Staphyloraphy; with cases and description of the instruments requisite for the operation. New York, 1833.

[Bushe, On Cleft Palate. New York, 1835. 8vo.—g. w. n.]

Mütter, Thomas D., M. D., A Report on the Operation for Fissures of the Palatine Vault. Philadelphia, 1843. 8vo.

732. The cleft in the soft palate occurs, not very unfrequently, as an original vicious formation, confined often merely to the *uvula*, which is then bifid, or including the whole soft palate. It is often also connected with a cleft of larger or smaller size in the hard palate, and also with hare-lip. The consequences of this misformation in early life, are great difficulty or complete incapability of sucking, especially in the horizontal posture. The bringing up of such children is, therefore, often accompanied with the greatest difficulty, suckling being only possible when the child is held quite upright, and when the flow of the milk is assisted

by pressure on the breast, or the food is in this position allowed to flow into the mouth, in very small quantities at a time. The consequences of this misformation are manifested at a later period of life, by its interference with the speech, which is more or less indistinct and unpleasant. The person so affected cannot blow out air from the mouth with any force; and fluids cannot be swallowed in the horizontal position without great difficulty.

733. Artificial palates, such as are employed in cleft of the hard palate, are ordinarily useless in this ailment; because they always produce the same interference in the articulation of tones; but very carefully made elastic obturators may in some degree lessen the difficulty (*a*); their use, therefore, may be permitted in those cases in which the union of the cleft does not succeed, or is especially impracticable (*b*). The cure can be effected only by the union of the cleft after previous paring of the edges. This operation, (*Gaumen-Naht*, Germ.; *Staphyloraphy*, *Kyanoraphy Uranoraphy Uraniskoraphy*,) first proposed by GRAEFE, and performed in the year 1816, is in itself of no great importance, but, on account of the difficulties in its performance, is one of the most delicate operations. The more full and the less apart the edges of the cleft are, and the less they are stretched, the more complete is usually the result of the operation. If there be at the same time a cleft in the hard palate, the perfect union of the cleft in the soft palate is but rarely effected; most commonly the operation is quite unsatisfactory. The operation should not be performed on children, but only in adults. Staphyloraphy may be also employed in other diseased conditions of the soft palate than congenital clefts; as, for instance, in wounds (*c*), and in the division produced by syphilitic ulcers and the like.

EBEL's advice is to prepare the patient for this operation by frequent dabbings, and brushings of the palate-curtain, by pressing down the tongue and the like for the purpose of accustoming these parts to irritation. GRAEFE's proposition is to excite active inflammation and superficial suppuration, by frequently touching with concentrated muriatic or sulphuric acid, the parts lying near the cleft in the palate-curtain, in order to render them fitter for union, by altering their tissue if it be too open, too soft, too full of the juices, too muco-membranous (*d*).

734. The operation of staphyloraphy, for the performance of which so many different, and some extremely complicated and unsuitable, modes have been proposed, is most simply and suitably conducted in the following way:—The patient being placed opposite a good light, the mouth wide open, and the tongue well depressed by the patient's own efforts; or the mouth kept open with a piece of cork introduced between the hinder grinding teeth, and the tongue depressed by an assistant with a simple spatula, half a line of the lower part of the left edge of the cleft is to be caught hold of with a pair of sufficiently long hooked forceps, gently drawn out, and a lancet-shaped cataract knife is to be thrust near the forceps through the edge of the cleft. The knife is then to be sawed from below upwards, and a strip as wide as

(*a*) GRAEFE's artificial palate-curtain; in his and WALTHER's Journal, vol. xii. p. 655. SNELL, J., Observations on the history, use, and construction of Obturators or Artificial Palates, illustrated by cases of recent improvement. London. Second Edition, 1828.

(*b*) For how little benefit is obtained from them see DIEFFENBACH in RUST's Magazin, vol. xxix. p. 491.

(*c*) FERIER; in Révue Méd., 1823, July. p. 245.

(*d*) SCHWERDT, above cited, vol. ix.

a straw separated up to the angle of the cleft. And, lastly, the little part where the forceps have been applied is to be cut off from above downwards. In the same manner the opposite side is to be treated, and especial care should be taken that, at the angle of the cleft, both cuts are very close, and joining at an acute angle, and that the removal of the edges be every where equal. The patient is then to be left quite quiet, and may frequently gargle with cold water, by which the slight bleeding is easily stopped, and the viscid mucus got rid of.

[The operation of staphyloraphy appears to have been first performed by Le Monnier, and is thus mentioned by Robert (*a*):—"A child had the palate cleft from the *velum* to the incisive teeth. M. Le Monnier, a very clever dentist, attempted with success to *re-unite the two edges of the cleft*, first making *several points of suture* to hold them together, and then *refreshing them* with a cutting instrument. Inflammation ensued, terminated in suppuration, and was followed by union of the two lips of the artificial wound. The child was perfectly cured." Upon which Velpeau observes:—"A child, a cleft, the suture, the refreshing, the cure, every thing, in spite of the somewhat vague expressions of Robert, scarcely permits us to doubt that this dentist, truly had recourse to staphyloraphy, and not to the suture of a simple perforation of the palatine vault." He also mentions, that "in 1813 experiments upon the dead body were made by Colombe, and that he was desirous of repeating them on a patient in 1815, who, however, refused." (p. 573.)]

For the purpose of keeping the mouth open and pressing down the tongue, artificial means, as the introduction of cork between the back teeth, Suchet's katagoglos (*b*), as well as the introduction of a blunt hook at the corner of the mouth, are superfluous; and the depression of the tongue with a spatula is so much the more dangerous, as thereby choking is only more provoked. The fixed purpose of the patient is fully sufficient. It must, however, be remarked, that during the operation the patient is to be often allowed rest and the mouth rinsed with cold water, partly to stanch the bleeding and partly for the removal of the mucus hanging about. The refreshing of the edges of the cleft from below upwards in the way proposed, is more certain than from above downwards, because the flowing of the blood does not interfere with the direction of the knife.

According to Graefe's original proposal, the edges of the cleft should be brought into a suitable condition for union, by removal with a chisel-like instrument, furnished with a counter-hold, or by touching them with muriatic, or sulphuric acid, caustic potash, tincture of cantharides, and the like. Subsequently, when this operation had been performed by others in a more simple manner, Graefe also employed for the removal of the edge of the cleft, a pair of curved forceps and a narrow knife, which he carried from above downwards. Roux, who commenced with the introduction of the threads, then laid hold of the lower part of one edge of the cleft with a pair of forceps, drew it out, and cut it off with a straight button-ended bistoury, sawing it from below upwards. Ebel (*c*) also and Krimer (*d*) use a pair of forceps and a simple knife, directing it from below upwards. Dieffenbach (*e*) freshens the edges of the cleft with a bistoury, laying hold of the edge of the cleft with a hook, and cuts off a straw's breadth with the bistoury, directed from below upwards. Bérard (*f*) makes his incision from below upwards. Alcock (*g*) used the fine scissors, which Roux also partially employed, in a bent form, in his later operations.

735. For the purpose of uniting the raw edges, a thread is to be used, on which two straight needles are threaded; each needle is to be held with a needle-holder, and thrust through, the edge of the cleft being fixed with a pair of forceps, from behind forward, at three and

(*a*) Mémoires sur differents objets de Médecine. Paris, 1764.

(*b*) Journal complément. du Dictionnaire des Sciences Médicales, November, 1822.

(*c*) Above cited, p. 86.

(*d*) In Graefe und Walther's Journal, vol. x. p. 622.

(*e*) Above cited, Feb., 1826.

(*f*) In Schmidt's Jahrbücher, vol. iv. pt. iii.

(*g*) Transactions of Apothecaries and Surgeon-Apothecaries of England and Wales. London, 1822.

a-half to four lines distance from the edge; the point of the needle is now to be taken hold of with the forceps which had hitherto held the edge of the cleft, and drawn out together with the thread. The other edge of the cleft is to be similarly treated. The number of stitches which are thus to be introduced, differs according to the size of the cleft. If the *uvula* be completely cleft, then from three to four stitches are necessary, and the upper must always be first put in. After the patient has been allowed a little rest, and cleared his mouth with water from blood and mucus, the threads must be tied together by means of the extended fore-finger against the wound, first with a surgical, and afterwards with a common knot, and cut off close to the knots.

Various modes of treatment have been recommended for bringing the cleft together. Graefe's hook-like needles, and the threading of the two ends of the suture into the lateral openings of a canula placed on the palate, and when the threads have been sufficiently tightened, is closed by means of a screw. Subsequently he employed nearly straight needles, and tied the threads (which were black and soaked with oil) in a surgical and afterwards in a simple knot (*a*). Roux used needles of a small curve and a needle-holder, and tied the threads together in two simple knots, in which the first is held with forceps till the second is looped, so that it may not meanwhile give way. Ebel (*b*) employs for the sewing, short, straight, double-edged needles, and a needle. Doniges proposes a long needle, like an aneurismal needle, with a very sudden curve, a sharp point having an eye immediately behind it and the stem fixed in a handle bent down, for convenience, like the handle of a gorget. The needle threaded, is passed from behind through either edge of the cleft, and the end of the thread on the inside of the needle curve, being caught with a hook or forceps, is drawn forwards and completely through; the needle itself still unthreaded, is then drawn back, its point carried behind the other edge, and having been thrust through, the thread on the outside of the needle curve is drawn forwards out of the needle-eye, which being thus set at liberty the needle is withdrawn entirely, the threads passed through each other and tied, by thrusting down between them a little plate six lines long, with a notch at each end for the threads to run in, two lines broad, and fixed on a stem four inches long, with a handle. Warren (*c*) proceeded in a similar manner, not only in the case he describes, but also in another on which he operated some years previously. "The principal difficulty he met with in this operation was in disentangling the ligature from the hook after it had perforated the palate, and he therefore proposed a curved needle with a movable point, which after having been passed through the soft palate, can be separated from the stem, unthreaded, and having been refixed and rethreaded with the hinder end of the thread, is passed through the other edge of the palate, and separated from the stem as before." As to the objections to this treatment, see Schmidt (*d*). Wernecke used a needle with an eye in front, and a whalebone handle. Lesenberg's (*e*) needle is similar to that of Doniges, but its point can be covered with a guard. Krimer (*f*) also uses a similar needle, which can be closed.

The instruments for drawing the knot have also been varied by the above-mentioned practitioners. Wernecke carried the knot up to the palate with two small grooved probes, and cuts of the end of the thread. Ebel used small tubes, and Doniges the special knot-tier, already mentioned.

Dieffenbach by means of a nearly straight needle, into the hinder hollow part of which a leaden thread has been introduced, unites the cleft by drawing the wire together; cuts it off a few lines distant from the soft palate, and turns the twisted ends upwards, so as not to irritate the root of the tongue. The lead wire allows

(*a*) Schwerdt, above cited, and in Graefe's Journal, vol. x. p. 371.
(*b*) Above cited.
(*c*) American Jour. of Med. Sciences, 1828. Nov.
(*d*) von Graefe and von Walther's Journal, vol. v. pt. ii. p. 338.
(*e*) Dissert. de Staphyloraphia quædam. Rostochii, 1827.
(*f*) von Graefe and von Walther's Journal, vol. x. p. 622.

loosening and much tightening. Dieffenbach also proposes to effect the union with a pair of peculiar forceps.

Hruby's palate-holder, is similar to Beinl's lip-holder (*a*).

Schwerdt's cleft needle for the introduction of the thread (*b*).

Bérard (*c*) thrusts in the needle from before backwards.—Smith's needle (*d*) is long lance-shaped, and furnished with a notch for the reception of the ligature. [But Mütter objects to it, "first, as being mounted on a straight handle, which renders it more difficult to introduce its point at the proper places; and secondly, the difficulty of disengaging the thread, which may be drawn back along with the needle in the attempts of the surgeon to disengage the latter from the margin of the palate." (p. 9.)]

Alcock (*e*) operated at intervals, so that he made raw, and united only one part of the cleft; in one case he only effected perfect union after five operations; in the first four he used the interrupted, and in the last the twisted suture.

Hartig (*f*) effects the union by means of a palate-cramp (*fibula seu retinaculum palati.*)

[Liston (*g*) introduces a double ligature on a curved needle fixed in a handle, through the front of the palate curtain, "the noose of which is caught by a blunt hook and pulled out into the mouth whilst the instrument is withdrawn. A second and smaller ligature is carried through opposite to this, and by means of this second thread the first and double one is brought through." (p. 503). Mütter uses a much curved needle half an inch in length and mounted on a cylindrical neck, a portion of which is held in the grasp of the porte, (Schwerdt's), and the other part made rough, is intended to be grasped by the forceps of an assistant. The cutting edge of the needle being wider than the diameter of its neck, will make an opening large enough for the easy transmission of the ligature. The forceps too may be improved, by causing them to close with a spring instead of a catch." (p. 9.)]

Fergusson, of King's College Hospital, has proposed a new mode of staphyloraphy, and has successfully treated two cases by it. "The principle of this new proposal is to divide those muscles of the palate which have the effect of drawing the flaps from each other, and widening the gap between them when they contract; so that the stretched *velum* may be in a state of repose, and the pared edges may not be pulled asunder by any convulsive action of the parts during the process of union. In other words he advises, as an important accessory to the operation of staphyloraphy the division of the *levator palati* and *palato-pharyngeus* muscles, and, if requisite, the *palato-glossus* (*h*).

736. If in very large cleft, the closure be difficult and only to be effected with great stretching, in consequence of which severe inflammation and tearing of the sutures are to be dreaded, the satisfactory result of stitching the palate is rendered most certain, according to Dieffenbach (*i*), by making an incision with a bistoury down to the bone on each side of the closed cleft of the palate, and half an inch distant from the lower edge of its arch. This immediately produces relief from all tension, the united edges hang loosely in the middle, unite together and the threads neither cut in nor through; the patient breathes freely through the holes, as otherwise the great swelling of the palate renders breathing very difficult. In the previous tension of the palate there is also great increase of substance as the lateral openings are closed by granulation in from ten to fourteen days. When at the same time there is a cleft in the hard palate and considerable separation of the edges of

(*a*) In von Graefe and von Walther's Journal, vol. ix. p. 323, pl. iii. f. 2.

(*b*) Above cited, pl. iv. f. 7.

(*c*) Above cited.

(*d*) North American Archives of Medical and Chirurgical Science, October, 1834.

(*e*) Above cited.

(*f*) Beschreibung eines neuen Apparates zur. Vereinizung des gespaltenen Gaumens ohne Naht. Braunschweig, 1841.

(*g*) Practical Surgery, London. 1837. 8vo.

(*h*) Medical Gazette, N. S., vol. i. p. 389. 1844–45.

(*i*) In Rust's Magazin, vol. xxix. p. 491.

the cleft, it may be necessary for effecting the union to separate the soft palate, to some extent from the hard palate, by two horizontal incisions.

Bonfils (*a*), after paring the edges, separates a V-shaped piece of skin from the palate, corresponding to the cleft, and unites it by the interrupted suture.

In a case in which the cleft of the soft was connected with that of the hard palate, and the distance of the edges was great, for the purpose of bringing them into contact, Roux, after putting in the stitches, and paring the edges, made two horizontal cuts, which divides the soft from the hard palate, and extended from the edge of the cleft somewhat above the perpendicular of the ligatures on both sides. The edges of the cleft may in this way be easily united.

In one case, in which with a cleft of the soft palate there was also a very considerable wolf's jaw, and the union of the soft palate thereby rendered impossible, Krimer (*b*) made on both sides two longitudinal incisions, four lines distant from the edge of the cleft, which joined together at an obtuse angle in front, and terminated behind at the still projecting portion of the soft palate; the soft parts were then divided by these cuts towards the edge of the palate, that a pair of wedge like flaps were formed with their bases behind. After the bleeding had been stanched with sage-water and alum, the flaps were turned inwards, so that their palatine surface was level with the floor of the nostrils, and the sewing together of the palate was then effected with the needle-holder in the ordinary way. Dieffenbach (*c*) proceeds more simply; after closing the cleft in the soft palate, he separates the soft parts on the hard palate, shaves the bone, and draws together the edges with lead wire.

[Mütter mentions that Warren of Boston, U. S., had succeeded in closing a deficiency in the upper part of a palatine cleft, or that portion which extended into the hard palate, by detaching the mucous membrane, and sliding it from each side to the median line, uniting the flaps by two or three sutures." (p. 20)].

737. After the operation, the patient may neither speak, nor take food, nor swallow his spittle, but must have it removed from his lips with a cloth, or carefully allowed to flow into a vessel, and every thing must be avoided which may excite coughing, sneezing, or laughing. At the end of the third the upper, and at the end of the fourth day the lower stitch may be removed, the knots being held with a pair of forceps and the thread cut by its side with a pair of scissors and drawn out in the contrary direction. Nourishing broths may be taken at first in small quantity and with great caution, and when the union has become firm, more solid food may be allowed.

According to Graefe, if the spittle be collected in the throat in quantity, we should attempt its removal by injecting, or by brushing off with a brush made with charpie or linen. A solution of from one to two grains of extract of belladonna may be at once given in a little water, by which the patient is much relieved. On the first days also he permits strong wine, with yolk of egg, given with a spoon, and nourishing clysters. The living activity in the edge of the wound may be increased by pencilling with muriatic acid, naphtha, equal parts of tincture of euphorbium, cantharides, and myrrh, or in torpid persons, with tincture of cayenne pepper or capsicum. The stitches should only be removed when they entirely or partially fall out of themselves. Dieffenbach also says that the patient may take fluid food without fear.

[Although the operation of staphyloraphy is generally unattended with danger, yet, in a few instances it has been fatal from the inflammation spreading along the windpipe to the lungs, as happened in the case of an English nobleman's daughter, who was operated on by Roux; the only one, of sixty cases on which he operated, which he lost. Berard (*d*) also mentions that he lost one case from *pneumonia*

(*a*) Journal de Médecine, 1830, December, p. 297.

(*b*) von Graefe und von Walther's Journal, vol. x. p. 625.

(*c*) Rust's Magazin, vol. xxx. p. 288.

(*d*) Article—*Staphyloraphie;* in Dict. de Méd., ou, Répert. gén. des Sciences Médic., vol. xxviii. p. 547.

originating in the same cause; and that, in another instance, the face was attacked with erysipelas, from which, however, the patient recovered.]

738. If the union be only partially effected, the mouth may be washed gently with red wine, and the open parts pencilled with honey of roses, tincture of myrrh and borax, only strong fluid nourishment is to be permitted; and the patient not allowed to speak. If an opening of two or three lines remain, it may be frequently closed by touching with muriatic acid; but if this be not effectual, these parts, three or four weeks after the completion of the scar, must be again stitched up. If the cleft do not unite at all, the edges soon scar with using red wine as a gargle and the pencilling just mentioned. The cleft is generally smaller.

Dieffenbach (*a*) endeavours to close such apertures in a peculiar manner. He makes on each side of the opening penetrating but parallel incisions, at the distance of a line from the edge, by which the tension is relieved, and an approach of the edges effected, which Dieffenbach still favours by introducing into the incision charpie soaked in almond oil. After the scarring of the latter he makes two similar incisions, though in contrary directions, which are held together in the same way.

739. Although after most of the modes of treatment for effecting the suture of the palate successful results occur, yet is the above-described simple mode of treatment to be considered most preferable, as from my own experience I have proved. That the lead wire has not the many inconveniences attributed to it by Graefe and Schwerdt (*b*), that by its hardness it presses, by its weight it tears, that cutting-in is not prevented, and that severe traumatic re-action is produced, have been long since disproved by the satisfactory and numerous results of Dieffenbach's practice even in the most difficult cases. To him owe we especially the greatest thanks in reference to his perfection of suture of the palate.

740. Even when the cleft is perfectly closed, the speech only becomes gradually more distinct as the tension of the soft palate subsides. The person operated on must first use himself to utter single letters, and afterwards syllables and so on.

IV.—OF THE OLD DIVISION OF THE FEMALE PERINEUM.

Noel; in Journal Général de Médecine, vol. iv.

Saucerotte, ibid., vol. vii.

Mursinna; in Loder's Journal, vol. i. p. 658.

Viet, De Ruptura Perinæi. Goettingæ, 1800.

v. Fabrice, C. E., Medicinisch-chirurgische Bemerkungen und Erfahrungen, Nürnberg, 1816. p. 1.

Schreger, Annalen des chirurgischen Clinicums auf der Universität zu Erlangen, 1817, p. 73.

Roux, in Journal Hebdomadaire, vol. i. No. iii.

Dieffenbach, Chirurgische Erfahrungen, besonders uber die Wiederherstellung zerstörter Theile. Berlin, 1829. No. v. p. 64; and in the Medicinischen Vereinszeitung in Preussen. 1837. No. 52.

Duparque, Histoire complète des Ruptures et Déchirures de l'Utérus, du Vagin, et du Périnée. Paris, 1836. 8vo.

Mercier; in Journal des Connaissances Medico-chirurgicales, 1839, March, p. 89.

741. Tearing of the *perineum* may be consequent on difficult labour,

(*a*) Schwerdt, above cited. (*b*) Above cited, vol. viii. p. 102.

when there is disproportion between the size of the child's head and the extensibility of the external organs of generation or artificial narrowing. The tear is often only at the *vaginal* edge of the perineum, but frequently extends throughout the greater part, more or less following the *raphe* to the edge of the *rectum*, or the whole *perineum* is torn into the *rectum*.—Slight tearings of the *perineum* are of little consequence and generally heal without assistance, the patient remaining constantly on her side with the thighs kept close together, and proper attention paid to cleanliness. But this rarely happens in large tears, as the wound is continually fouled by the lochial discharge, and at every time of going to stool the wound is opened. In complete tearing of the *perineum* between the *vagina* and *rectum* it is quite impossible to retain the stool if the greater part of the *sphincter ani* be torn. If in a torn perineum union cannot be effected, the two edges of the wound skin over, and the cure is only possible by removing the skinned edges and by union with the stitch.

From what has been said, it follows that in considerable tears of the *perineum* it is most safe immediately to effect its enclosure by stitching. It must not be overlooked, however, that the parts are rarely in a suitable condition for quick union, and that if there be swelling and inflammation of the edges of the wound, union is thereby contra-indicated. If the woman herself object to this treatment, if accompanying indisposition, or the circumstances already mentioned forbid it, the position on the side must be persisted in, with the thighs a little drawn up towards the body and tied together (1), care also being taken for proper cleanliness, for soft motions, and for drawing off the urine from time to time with the catheter. The healing which in this way takes place in small tears of the *perineum*, does not depend on any union of the edges, but on its shortening backwards, so that the *labia pudendi* extend back and occupy the place of the former wound. The greater the tear the shorter becomes the *perineum*, and the longer, on the contrary, the *labia* and great fissure, the former at the same time losing their fulness, and becoming thinner. If the tear of the *perineum* extend into the *orificium ani*, the *labia* are drawn backwards by the scarring, and their hind extremities are held together by whitish callous scar; it seems as if the *anus* had moved further back, and the *labia* were drawn with it.

Sometimes there is a central tear of the *perineum*, and the whole child is thrust through it (*a*). The cure in this case may be effected by the natural powers; but if the tear extend on the sheath of the *rectum*, it has never been seen to take place.

Large and recent tears of the *perineum* can be alone satisfactorily treated with the stitch, as all other remedies proposed for bringing the wounded edges together, either graduated compresses on both sides, and fixing them with bandages, (Jörg.) Moulin's perineal forceps (*b*), or the introduction of different bodies into the *vagina* for the purpose of removing and absorbing all fluids, are extremely uncertain.

[(1) Duparcque does not agree with drawing up the thighs. He says:—"I think it better to leave the thighs completely extended, a position, in which the buttocks being more close together, at the same time diminishes the perineal space," (p. 422). He also thinks other means more effective in producing compression may be had recourse to, and mentions a case in which he "introduced into the *vagina* a large flattened gum elastic pessary, having a large central aperture, into which he fixed the funnel-shaped extremity of a large elastic tube. The pessary pretty exactly fitting the *vagina* prevented the lochial discharge filtering between it and the sides of the canal, and consequently from getting between the lips of the tear. As the instrument reached above the top of the wound, it could not prevent the meeting of its edges; besides, the compression which it exercised on the *rectum* contributed to keep up the constipation he desired." In addition to this he placed a long cotton cylinder along each side of the torn *vulva* and *perineum*, confined them by a double-

(*a*) Dupuytren, Pourchier; in Gazette Médicale, vol. iii. First Series, pp. 684, 866.
(*b*) v. Froriep's Notizen, vol. xxiii. p. 26.

tailed T-bandage, the tails of which, continued between the trochanters, and ischial tuberosities, had their inner edges brought together by sewing. The case did well.]

742. Small tears of the *perineum*, cured as already mentioned, are accompanied with no further inconvenience than with the disagreeableness of a great width of the *vagina*. Larger tears cause besides the usual relaxation of the *vagina*, protrusion of its front or hind wall, also dropping and prolapse of the womb; the ability of retaining the stools is not prejudiced, but wind frequently escapes, and in *diarrhœa* the needs are very pressing. As the woman is generally alarmed at her condition, such cases rarely become the object of definite treatment. The changes of the external generative organs thereby produced, are, however, of such kind, that all simple tears of the *perineum* should be treated with the greatest care. In the old tears which have extended into the vent, the impossibility of retaining the stools continues; at least, in that case the flatus and soft motions pass away unexpectedly on the slightest excitement.

["Slight cases (of torn *perineum*) will often," says Dr. CHURCHILL (*a*), "heal without assistance. Even when the rent is more extensive, a cure may be effected without further interference than great cleanliness, keeping the patient in one position, so as to preserve the edges of the wound in contact, and constipating the bowels after free purgation." (p. 409.) My friend Dr. WALLER informs me that most of the cases of torn *perineum* which have come within his knowledge, have done well without any operation: and that even after the most severe tears, as when the *m. sphincter ani* is torn through and both *rectum* and *vagina* are laid into one, he has known instances of recovery with capability of retaining the motions, and with the simple inconvenience of the patient being compelled to hasten quickly to the water-closet, immediately on feeling the slightest disposition to go to stool, as when the motions approached the vent they could not be restrained from voidance. How under such circumstances the stools are retained may perhaps be explained by Dr. BURNS's observation (*b*), that "it sometimes happens that the torn extremity of the *rectum* or the anterior parts containing a fragment of the sphincter or a portion of the internal sphincter, as it has been called, forms a kind of flat valve, which rests on the posterior surface at the coccyx, so that the orifice now resembles a slit, and the fæces, unless very liquid, remain in the hollow of the *sacrum* and do not pass through the valvular orifice till an effort be made to expel." (p. 68.)

The scarring of the lips of the torn *perineum* DUPARCQUE describes as taking place "in two directions; at first in its thickness, so that the skin of the *perineum* and the mucous membrane of the *vagina* approach and run into each other, except where the perineal partition is very thick and there an intermediate scar is produced, having the characters of mucous membrane. The scarring occurs also at the same time in the longitudinal direction of the lips of the wound; this shortening is only effected at the expense of the tissues corresponding to the angles. In the case of tearings of the *furcula* and *perineum*, the *labia* which alone can readily stretch, are then drawn back by this mode of scarring; thus we may be assured that in women who have had the *furcula* deeply torn, the size, which the *vulva* has preserved depends in great part on this lengthening of the *labia*; sometimes even their commissure is confounded with the margin of the *anus* without any distinguishable trace of intermediate scar. This mechanism of the scarring explains, why the existence of a bridle separating the *vulva* from the wound, in central tearing of the *perineum*, renders scarring much more difficult and tedious than when the tear has been complete. In reality, the presence of this bridle, which is formed by the posterior commissure of the *vulva*, preventing, to a certain degree, the assistance afforded to the scarring lengthways by the elongation of the *labia*, either retards it considerably, or causes a fistulous opening. Cut this bridle, and you then observe the scarring, which up to

(*a*) Observations on the Diseases incident to Pregnancy and Childbed. Dublin, 1840. 8vo.

(*b*) Principles of Midwifery, &c. 6th Edit. London, 1824. 8vo.

that period had seemed stationary, make rapid progress and completely perfected." He farther observes, that "what has been mentioned in regard to the *vulva* applies also to the *anus;* it is by a similar mechanism, that tearings or ruptures which involve this opening and a part of the recto-vaginal partition, scar; the scarring occurs both in the direction of thickness and length; by the latter extremities of the divided *sphincter ani* stretch and approach the rectal angle of the wound, contributing more or less to fill it up; the *anus* is then actually enlarged. In fact, the sphincter being then much outspread, at last embraces nearly the whole of this very large *anus*, which to a certain point is only as large as ordinary. Thus the excretion of the stercoraceous matter, which was involuntary, often terminates by returning to the natural control of the will. On the other hand, the edge of the rupture formed by the recto-vaginal partition, having been drawn together, in consequence of this mode of scarring, descends lower, forms a sort of spur, a kind of valve which opposes itself to the passage of the intestinal contents into the *vagina*, which had previously occurred. Thus, then, the deep ruptures or tearings of the *perineum* extending to the anus and recto-vaginal partition, may be had without any other inconvenience than that resulting from a very large opening." (p. 415–18.)]

743. Operation on an old tear of the *perineum*, when extending into the *rectum*, is always most uncertain as to its consequences, and so much the more so if the tear be large, and connected with loss of substance and much callosity of the edges, and if the endeavour to bring the edges together be fruitless. In bad condition of the powers, in lymphatic scrofulous persons, in habitual *diarrhœa*, the operation is contra-indicated if these evils cannot be got rid of by suitable treatment.

744. The skinned-over edges of the torn *perineum* are to be refreshed in the following manner. After suitable purging, the patient is to be laid on either side, with the thighs drawn up towards the belly, so that the breech projects beyond the edge of the bed, or she is to be laid in the same position as in cutting for the stone. If the *perineum* be covered with hair, it must be carefully removed. An assistant separates the buttocks from each other, and holds back any accompanying protrusion of the *vagina*. The operator, after having ascertained the extent and state of the separation, takes hold of the lower edge of the cleft with a pair of forceps, used as in the operation for entropium, and cuts off the part taken hold of with a bistoury, or less advantageously with scissors. He then proceeds with the upper edge in a similar way, and freshens both edges of the cleft to such extent as will enable them to unite; care is also to be taken that no part covered with skin remain. As soon as the bleeding has been perfectly stanched with a sponge dipped in cold water, and all the clotted blood has been removed, the cleft is to be united with two interrupted sutures, for which purpose a sufficiently strong curved needle, with a handle, and furnished with waxed threads, is to be introduced and thrust through the whole thickness of both edges, an inch and a half from the angle, the threads being drawn after it; and, in this manner, four lines nearer the *pudendum* a second, and if the size of the cleft require it, a third bundle of threads is to be introduced. The edges of the wound after proper cleansing are to be brought together, and the threads next the *rectum* are to be drawn together with a double knot sufficiently to bring the edges of the wound into contact. Instead of the interrupted, the quill stitch may be employed, which by its equal operation on all parts of the wound keeps the union close, as is especially confirmed by Roux's successful results. The wound is to be covered with a pledget and compress, which may be fastened with a T-bandage

or left uncovered ; or a piece of sponge is applied, which is preferable, as the fluid flowing from the *vagina* does not collect upon the superficial pieces of the bandage. If in the union there be much tension of the edges of the wound, two parallel cuts must be made through the skin (Dieffenbach). The patient should remain after the operation upon her side, with the thighs drawn up and close together.

This operation was first proposed by Ambrose Pare, and successfully performed by Guillebonneau ; Mauriceau, La Motte and Smellie have recommended it; Noel and Saucerotte have successfully practised it; and subsequently it has been undertaken by Dupuytren, Mursinna, Menzel, Osiander, Dieffenbach, Montain, Roux and others. The mode of proceeding as to refreshing the edges is the same in all cases but varies considerably as regards the union. Guillebonneau employed the interrupted stitch ; Moriceau, La Motte, and Smellie recommend the suture with penetrating stitches; Noel, Saucerotte employ the twisted stitch; Dieffenbach both it and the interrupted; Roux and Montain the quill stitch. Ritgeon (*a*) took a thread with two needles, thrust the one deeply on one side into the cleft at the edge of the skin, and carried it through an inch from the edge of the wound into the *vagina* where he drew it tight with a slip-knot. In this way the membrane of the *vagina* is brought together in several folds, which keep the fluid from the wound. If there be at the same time injury of the *m. sphincter ani* the twisted stitch must be applied.

[In a successful case operated on by Davidson (*b*), he "passed deeply a strong double ligature by means of a common curved needle, close by the edge of the *rectum*, and another, rather more than half an inch from the first, towards the *vagina ;* after which he pared the edges of the wound, which he had not previously done, that he might not be annoyed by the oozing of blood, so as to be enabled to place the ligatures more accurately. The ligatures being introduced, he employed as cylinders two pieces of elastic gum catheter, about an inch and a-half in length, one of which was placed in the loops which the double ligature formed on one side, and the other between their separate ends, tying them firmly upon the cylinder." To prevent the eversion of the edges of the wound which Roux found to be produced by the quill suture, and which he remedied by several small stitches at different points between the sutures, Davidson "armed a curved needle with a piece of narnow tape, four inches long, having a knot at one end; this was down each end of both cylinders about half an inch, and brought outwards, the end of the tape being prevented slipping through by the knot; the tapes were then placed in such a situation as to be intermediate to the ligatures; this being done, he turned the cylinders gently towards the edge of the wound, and tied the corresponding tapes over it." p. 225.]

745. The principal object after the operation is to produce, by the use of gentle purgatives, daily, soft motions, which should be received into a draw-sheet, and the patient must strain as little as possible. The urine must be received into a tin receptacle from which a leathern pipe passes into the night-stool, without needing any change of posture. Only when there is retention of urine the catheter is to be used, directed merely by the fore-finger of the right hand. The dressing is to be renewed as often as cleanliness requires, and if there be any unnatural secretion from the *vagina*, cleansing injections are to be used each time. Between the eighth and twelfth day the threads are to be removed and the *perineum* covered with charpie dipped in lead wash. If the union be only partial, the inconvenience is, however, often diminished ; but if this be not the case a second closure must be undertaken. Many observations prove that a perfectly united *perineum* remains uninjured in a subsequent labour.

(*a*) Gemeinsame deutsche Zeitschrift für die Geburtskunde, vol. iii. pt. i p. 168.

(*b*) Lancet, 1838–9, vol. ii.

Attempts have been made to sustain an artificial retention of the fæces, for six or eight days, and even longer, so that the union might be undisturbed. Dieffenbach gives, for two days prior to the operation, little but nourishing food, then a laxative, and on the day of operation an opium pill to produce and to keep up costiveness for six or eight days, after which he gives castor oil. But with all care and employment of remedies for facilitating the discharge of fæcal matter after long costiveness, their discharge is very difficult, accompanied with severe effort, and may destroy the scarcely effected union. Thus in Saucerotte's case, in which the union failed, the stitches tore on the eleventh day on account of the violent effort in going to stool, and in which a second operation, in which a tight suture had *cut through* the *m. sphincter ani*, succeeded, care having been taken for the easy relief of the bowels. Roux employed in one case costiveness, which the patient had learnt by refraining from food, and by the use of opium, so perfectly to effect, (for the purpose of improving the unpleasantness of her situation,) that the motions were retained till the twenty-second day, and on account of their hardness required to be helped forward by pressure of the finger from the *vagina*; he recommends, however, on the contrary, when not habitual costiveness is to be relied on, to render the excrements fluid, and he proposes this as a principal point in the after treatment.

[In Davidson's case, the bowels were constipated by opium, the urine drawn off night and morning, and the diet was confined to small quantities of gruel and hard biscuit. The ligatures were removed on the seventh day, the union being complete. After nine or ten days the urine was voided naturally, and on the seventeenth the bowels were relieved. At the end of six or seven weeks she went about as usual.]

Horner (*a*) recommends, after the union is perfected, to cut through the *m. sphincter ani*, so that the sutures should not be torn out in going to stool.

Old perineal tears rarely heal by quick union; on the contrary, experience shows that such are more liable, by suppuration and ulceration, to a change, whereby indeed its connexion cannot be again naturally produced, but a certain continuity of skin may be attained, similar to the formation of a mucous membrane, which, from the pressure and rubbing in walking, becomes gradually insensible, and thus the patient's condition is much improved. In all cases in which, where the long continuance of the perineal tear gives less hope of the quick union, or where it is not effected, this mode of skinning over should be attempted, in which the callous edges are removed, the inflammation properly excited by digestive remedies and by lunar caustic; but especially by keeping from the wound the fæces and urine, and if the granulations will not harden, to endeavour to effect this by the use of lead or zinc. Schreger (*b*).

Nevermann's proposition (*c*) may be mentioned, to persons fearing the knife, to strew upon the skinned edges unslaked lime, or strips of linen powdered with lime, which after sufficient operation, is to be washed off, and the patient kept perfectly still with her thighs together.

B.—OLD SOLUTIONS OF CONTINUITY WHICH SUPPURATE.

I.—OF ULCERS.

First Chapter.—OF ULCERS IN GENERAL.

Astruc, J., Traité des Tumeurs et des Ulcères, &c. Paris, 1759–68. 2 vols. 12mo.

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(*a*) American Journal, 1837. (*b*) Above cited, p. 75. (*c*) Above cited, p. 487.

Bertrandi, A., Opere Anatomiche e Cerusiche. Torino, 1786–96.
Henke, Fragmente über die Pathogenie und Therapie der Geschwüre; in Horn's Archiv., vol. ii. p. 1.
Rust, J. N., Helkologie, oder über die Natur, Erkenntniss und Heilung der Geschwüre. Wien, 1811. 2 vol. Second Edit.; with copper plates. fol. Berlin 1838.
Rust, J. N., Einige Bemerkungen über das Wesen der Geschwüre. Ein Beitrag zur Bearbeitung der Helkologie; in his Magazin fur die gesammte Heilkunde, vol. xii. pt. iii. p. 512.
Rust, C., De Ulcerum diagnosi et ætiologia nonnula; cum tab. vii. col. Berol., 1831. 4to.
Bluff, M. J., Helkologie. Lehre von Erkenntniss und Behandlung der Geschwüre, Berlin, 1832. 8vo.
Hunter, John, Lectures on Surgery. Palmer's Edition. Vol. i.

746. An *ulcer* (*Ulcus*, *Helcoma*, Lat.; *Geschwür*, Germ.; *Utcére*, Fr.) is a long existing division of organic parts depending on irregularity of the vegetative processes, and accompanied with the secretion of an ichorous and sanious fluid, and a continuing destruction of the parts in which it is situated. Ulcers are therefore distinguished from abscesses and suppurating wounds, but may originate from them, if by a change of vitality in the suppurating surfaces the process of *regeneration* be converted into *ulceration* or ulcerative absorption.

747. The causes of ulcers are either *internal* or *external*. The former consists in a peculiar deviation of the whole organism, or of single organs, from the natural type, with a great degree of weakness and flabbiness, or with those diseases, of which the ground depends on some change in the assimilation, for instance, acute and chronic eruptions of the skin, scrofula, syphilis, gout, scurvy, dropsy, suppression of the usual discharges, and the like. These diseases, either of themselves, or after the operation of an occasional cause, produce an ulcer. The external causes are all injuries which, producing inflammation and suppuration, break up the connexion of parts; wounds, abscesses, the healing of which is prevented by an existing disease, or by improper treatment; specific diseased matter operating locally, and the like.

748. Ulcers are divided into *simple* and *complicated*. Simple ulcers are those which are connected neither with peculiar local nor general disease, but depending only on the decided destruction of connexion which accompanies them, according to the condition already stated (*par.* 746). *Complicated* ulcers are, on the contrary, those connected with peculiar local or general disease. In regard to local complication, there may be distinguished *fistulous*, *callous*, *œdematous*, *varicose*, *fungous*, *sloughy*, and *carious* ulcers; further, ulcers, with a secretion of thin, lardy, acrid, stinking, saline, and variously coloured matter. General complications consists in the presence of the diseases and dyscrasies above mentioned (*par.* 747); hence are distinguished *atonic*, *scorbutic*, *arthritic*, *syphilitic*, *carcinomatous*, and *impetiginous* ulcers.

From what has been said it results that ulcers may be *local* and *general* ailments. It is, however, to be herewith remarked, that ulcers which at first depend on a decided internal cause, often previous to healing, become merely local; and so, on the contrary those which at first were actually local, in their course draw the whole body into participation, and may become complicated ulcers.

749. The reaction of ulcers upon the whole organism varies according to their nature. In specific ulcers the general indisposition is increased by the absorption of the pus secreted in the ulcers, and tainted with the

specific poison. In ulcers in which the secretion of pus especially is very great, and of a bad kind, there arises a general weakness, partly from the continual loss of the juices, partly from absorption of the bad pus; in the end complete *cachexia*, with altered pulse, often chills alternating with heat, difficult breathing, drawing pains in the limbs, dryness or great secretion in the ulcer, purulent urine, dropsical swellings, colliquative sweats, and *diarrhœa*. If the ulcer be of long standing, its secretion operates in relation with the other secretions, and the ulcer is to be accepted into the series of natural secreting organs. This is especially the case in old persons, in whom, with long-continued ulcers, the urinary secretion is considerably diminished. Ulcers may, therefore, themselves be considered as useful discharges in certain cases, and belong to the relative well-being of the patient so affected.

750. The *prognosis* in ulcers varies:—1. *According to the nature of the cause* which produces or sustains it. 2. *According to the position of the ulcer.* Here the importance of the affected part and of the neighbouring tissues must be considered. Ulcers in the skin and in fleshy parts heal more readily than those in tendinous parts or glandular organs. Ulcers in bones are always very intractable. In parts distant from the heart the cure is always difficult. 3. *According to the duration and external form of the ulcer.* The older an ulcer is, the more tedious is its cure, and if this be forced, dangerous symptoms may be produced by suppression of its usual secretion. The more foul an ulcer is, the more spotty its bottom, the more everted and hardened its edge, the more ill-conditioned the fluid secreted in it, the deeper it penetrates and the larger the destruction of soft parts which it produces, the more difficult is the cure. Round ulcers are generally more tedious in their cure than oval ones. 4. *According to the constitution and age of the patient.* In young subjects, if the constitution be little affected by the reaction of the ulcers, the healing is quicker than in old and already much debilitated persons.

751. The *treatment* of ulcers in general, depends on the removal of the causes which have given rise to them, and on such alteration in the living activity of the ulcerated parts, that by the natural manifestation of the reproductive processes the destruction of continuity may be again repaired.

In the progress of ulcers towards healing three stages are to be noticed: 1. *The stage of purification (Stadium Digestionis, Detersionis);* the ulcer loses its foul appearance, and instead of ichor, good pus is secreted. 2. *The stage of the formation of granulations (Stadium Incarnationis, Granulationis.)* 3. *The stage of Scarring, (Stadiam Cicatrizationis,)* in which the granulations become harder, become connected, and are covered with a delicate skin.

752. The treatment must be variously directed, according to the *cause* of the ulcer, its *living disposition*, and its *form*. First, of its treatment in reference to the latter two points.

753. Every ulcer may have an *inflammatory*, *erethetic*, or *torpid* character.

In the inflamed condition of an ulcer which is produced, either by the constitution of the patient or by the improper use of irritating reme-

dies, the parts surrounding the ulcer are swollen, hot, and painful; its base is much reddened, sensitive, covered with white streaks, and the secretion of pus especially small. In these cases every local and general irritant must be removed, the ulcer covered with lukewarm softening fomentations, poultices, or mild salves, and in strong constitutions, even general antiphlogistic treatment must be employed. In proportion as the inflammation diminishes, the secretion of pus increases.

If an ulcer be in an erethetic condition, its base is also very much reddened, but its sensibility extraordinarily increased. Here are serviceable narcotic remedies, both internally and externally; rubbings in of warm oil of henbane, poultices of hemlock, henbane, and the like.

In torpid conditions, depending on local or general weakness, the ulcer shows relaxation; the surrounding parts are pale, relaxed, and œdematously swollen; the ulcer is insensible, and secretes a quantity of ill-conditioned thin pus. Here such local and general treatment must be employed as may increase the living activity and thereby promote the secretion of good pus. (Compare *par.* 62.)

754. The variety of ulcers, in reference to their form, requires peculiar attention in their treatment.

The Foul or *Gangrenous Ulcer* (*Ulcus putridum, gangrenosum*, Lat.; *faule oder brandige Geschwür*, Germ.; *Ulcère gangréneux*, Fr.) is characterized by a foul, grayish-yellow or blackish surface, by insensibility, and by the secretion of a discoloured very fetid pus; the sloughy character often spreads over the whole extent of the ulcer and the parts are either gangrenous or sphacelated. The causes of this change in the ulcer may be neglect of cleanliness, improper treatment, impeded circulation, foul air, bad food, gastric impurities, weakened constitution, debility of the vascular system, *cachexia*, and the like.

The *treatment* consists in removing the causes, and in employing such remedies as promote throwing off the gangrenous parts or the restoration of those, not yet completely destroyed to their natural vitality, which is to be attempted by the use of internal and external remedies. Bark, valerian, camphor, naphtha, the mineral acids, and so on, are employed internally; externally, decoction of bark, or oak bark with lime water, of walnut shells, of water-germander, with spirits of wine, vinegar, and so on; aromatic spirituous washings of the surface surrounding the sore, charcoal powder with bark, oil of turpentine, digestive salves of myrrh, or camphor, solution of chloride of lime, fermenting poultices of flour, yeast, and honey. In general the resins or essential oils are more effective than moist remedies. If general dyscrasy exist, suitable remedies must be employed. When portions of the surface of the ulcer have separated, they must be removed; and cuts made when collections of pus beneath the destroyed parts are to be feared. Frequent cleansing especially, the local application of oil of turpentine, spirituous remedies, tincture of aloes, or sublimate, must be had recourse to against the worms and maggots which are not unfrequently produced in these ulcers. More suitable than these numerous and in their operation very different remedies, is the use of mild aromatic applications, or poultices, by which the living activity is best increased, and the foul smell also diminished, as already mentioned, (*par.* 72) in the general treatment of gangrene.

The solution of chloride of lime in water in different proportions, according to the vital disposition of the ulcer, is recommended as most highly efficient in gangrenous, and especially in foul and torpid ulcers (Percy, Labarraque.) Lisfranc (*a*) bandages the ulcer with a moistened compress, and applies on it charpie soaked in a solution of chloride of lime. Lemaire (*b*) uses one part of chloride of lime and three parts of water. Ekl (*c*) first employed fifteen grains of chloride of lime in eleven ounces of water, and afterwards four grains to an ounce. According to Climates (*d*) it should only be applied when all inflammation has subsided. Biett, Clocquet, and others have used it with much advantage; and according to Cuillvier and Boulay, the ill smell is immediately got rid of on its application (Pigné).

755. The *Callous Ulcer* (*Ulcus callosum*, Lat.; *callöse Geschwür*, Germ.; *Ulcère calleux*, Fr.) is surrounded by a whitish, dry, insensible edge, not unfrequently of considerable thickness, and cartilaginous character. This callosity often spreads over the whole ulcer. The cause of this change is a want of blood or of the nourishing juices in the edges of the ulcer; hence these callosities occur most commonly in old persons in those places where naturally the course of the blood is languid, or is prevented by accidental pressure, in bad treatment, in the improper use of relaxing ointments, or as consequent on a continued irritable condition of the edges of the ulcer, whereby a stagnation of the juices, and a similar change is produced, as in induration. Such callosities prevent the cure of the ulcer, and must therefore be resolved or removed. Only when they are not very hard, and quite insensible, softening and at the same time exciting, applications of aromatic vegetables may be employed, the *empl. de cicutâ cum ammoniaco*,—*mercuriale*,—*gummosum*, *saponatum*, *diachylon cum gummi*; a solution of *muriate of ammonia*. If these remedies be of no avail, then we must proceed to the use of escharotics, as butter of antimony, lunar caustic, caustic *ammonia*, a solution of caustic potash; scarification, or complete removal of the callosity with the knife, if the situation of the ulcer permit.

756. The *Œdematous Ulcer* (*Ulcus œdematosum*, Lat.; *œdematöse Geschwüre* Germ.; *Ulcères édémateux*, Fr.) is, in its origin, connected with dropsical swelling, which receives the impress of the finger; its edges are flabby, pale, often even œdematous; the granulations pale, and the secretion of a watery ichor very copious. The causes are either local, mechanical, or internal, as pressure on the vessels retaining the blood, general or local weakness, lymphatic habit, and the like. The treatment of this ulcer requires, besides the removal of the cause, and beside those remedies which alter the torpid character of the sore, a continued compressing bandage, by swathing the whole part on which the ulcer is situated.

757. *Fungous Ulcers* (*Ulcera fungosa* Lat.; *Schwammigten Geschwüre*, Germ.; *Ulcères fungueux* Fr.) are beset with growths either on their entire surface, or only on certain parts, or at their edges, which vary considerably as to their condition, being sometimes flabby, pallid, or deep red, insensible, and bleed easily; sometimes they are of a more firm character, have a bluish red colour, and are very sensitive. The

(*a*) Révue Médicale, 1821.
(*b*) Archives Générales, vol. ix. p. 138.
(*c*) Rat. Med. in schola cl. med. et chir. univers. Landish, 1826.
(*d*) Froriep's Notizen, vol. xvi. no. 7. p. 107.

former are merely unnatural growths of the granulations, but the latter must be considered as malignant degenerations. The causes of this fungous degeneration may therefore be, long-continued torpid condition of the ulcer, improper use of debilitating remedies, too slight bandaging, the neighbourhood of carious bone, or the carcinomatous condition of the ulcer. The removal of such growths, which is necessary for healing the ulcer, is affected, if the granulations be of moderate growth, by a simultaneous treatment corresponding with the vital disposition of the ulcer, by a suitable compression with dry charpie, and frequent touching with lunar caustic; but if they be more considerable and exist as a malignant degeneration, they must be removed by the energetic application of *escharotics*, by *cutting off*, or by *tying*. The usual escharotics are *lunar caustic*, *caustic potash*, *butter of antimony*, *sulphuric acid*, *sulphate of zinc*, *burnt alum*, and the like. These should be especially employed if the fungous growths be equally spread over the whole surface of the ulcer. The dry escharotics may be strewed upon the sore, or applied in form of ointment; the fluid painted on with a pencil after the ulcer has been properly cleared of the effused ichor. The former are more suitable rather in a flabby state of the fungous excrescences, and great secretion of ichor; the latter in greater firmness of the growth, and less effusion. If the fungus grow only partially from the ulcer, it may be most easily removed with the knife, by cutting it off at the base; by tying, when the fungus has a neck, and the patient dreads the knife, and much bleeding is feared from the excision. In those cases in which the remedies prescribed do not effect the destruction of the excrescence, or may produce awkward symptoms by their fluidity and spreading, if the use of the knife or ligature be not possible, then the destruction of the fungus is only to be effected by the use of the actual cautery. The bleeding which often arises spontaneously, or in either of the preceding modes of treatment, from the fungous surface, must be stanched by styptics, compression, actual cautery, or by the entire removal of the fungus.

758. *Varicose Ulcers* (*Ulcera varicosa*, Lat.; *varicosen Geschwüre*, Germ.; *Ulcères variqueux*, Fr.) occur most commonly in the lower extremities; are for the most part oval and superficial; their base bluish, their secretion serous and bloody; the edge in old ulcers mostly callous, and the surrounding skin brown; accompanied with various veins of the leg, especially around the ulcer, and œdematous swelling. Not unfrequently do they bleed periodically; ordinarily they are not painful, but frequently very painful, even without any trace of inflammation. These ulcers are in direct relation to the varicose affection, and all those evils which produce hindrance to the return of the blood, as pressure, continued standing, remaining in warm or cold moisture, must be considered as their cause; hence certain trades, pressure of the pregnant womb and the like. Predisposition to varicose affections is grounded especially on plethora, full juicy lax habit, venous stagnation, and loaded state of the intestines; hæmorrhoidal disposition; suppressed hæmorrhoid and menstruation. Hence it happens that, in many instances, these swellings of the veins are only symptoms of a deeper affection, and may even belong to the relative well-being of the patient. They arise either from accidental injury in existing varicosity, or from the

blood-knots running into suppuration; or other ulcers of a specific character are converted into them.

In the *treatment* of these ulcers, their causes must be first attended to; venous stagnation and loaded bowels must be relieved by purging, regulation of the mode of life, diminished standing, relief of pressure, and the like. The whole ulcer is to be simply covered with dry charpie; but the varicose and œdematous swellings are to be especially counteracted by swathing with bandages and by the circular application of sticking-plaster. If the cure be effected, its recurrence must be prevented by careful diminution of the occasional causes, with continued swathing by means of laced stockings of dog's skin (*a*).

The rules already laid down in abscesses (*par.* 65) apply to the treatment of fistulous ulcers.

759. If the ulcers have existed a long while, and have attained the rank of natural secreting organs, derivatives by issue, and so on, must be established before they are perfectly scarred. If in the sudden suppression of the secretion of an ulcer symptoms of metastasis ensue, the ulcer should be, as soon as possible, again brought to discharge by using acrid irritating remedies. In an ulcer, where for these reasons a cure cannot and, dare not be undertaken, we are restricted to proper cleanliness, and the getting rid of local complication, for the purpose of diminishing the inconvenience which the patient suffers.

Second Chapter.—OF ULCERS IN PARTICULAR, IN REFERENCE TO THE CAUSES WHICH PRODUCE AND KEEP THEM UP.

I.—OF ATONIC ULCERS.

Underwood, Mich., A Treatise upon Ulcers of the Legs, Scrofulous Sores, &c. London, 1783. 8vo.

Ib., Surgical Tracts on Ulcers of the Legs, &c. London, 1788. 8vo.

Meytler, F. H., Abhandlungen über die alten Geschwüre der unteren Gliedmassen. Wien, 1793. 4to.

Home, E., Practical Observations on the Treatment of Ulcers of the Legs; with observations on varicose veins and piles. London, 1801. 8vo.

Baynton, Thos., A new descriptive Account of a new Method of treating Ulcers of the Legs. London, 1797. 8vo.

Oslhof, A., Untersuchungen und Beobactungen über die chronischen Geschwüre mit besonderer Ruchsicht auf die sogennanten alten Schäden an den interen Gliedmassen. Lemge, 1804.

760. *Atonic Ulcers* (*Ulcera atonica*, Lat.; *atonischen Geschwüre*, Germ.; *Ulcères atoniques*, Fr.) are kept up by general or local weakness, which is manifested by lax fibre and flabbiness. They are mostly situated in those parts, of which the living activity, under natural circumstances, is not very great. Hence are they most frequent on the feet, of which the left is much more commonly affected than the right. Certain occupations which interfere with the flow of blood in the lower extremities, and are connected with continued standing, are favourable thereto. They

(*a*) Kothe, Varicose Venen und varicose Geschwüre an den Unterschenkeln; in Rust's Magazin, vol. xxx. p. 82.

are either produced by an external injury, or they may originate in independent patches, in which case there appears at some one single spot redness and slight swelling; the skin becomes thin and breaks; the ulcer enlarges, is more or less painful, and usually produces the local and general changes which have been mentioned. These ulcers are commonly accompanied with œdematous or varicose swelling of the feet, or with callous edges. They are mostly of a torpid character, though they may, from accidental causes, assume an erythetic, or inflammatory condition.

761. The *prognosis* is guided according to the general circumstances already laid down (*par.* 750); and it is to be especially noted, whether the patient can or cannot diminish the occasional causes.

762. The *treatment* of these ulcers, which seem to me most satisfactory, is the following:—If the ulcer be without peculiar complication, and if it have a good appearance, I make use, with rest and suitable support, of frequent bathings with lukewarm decoctions of chamomile flowers, and compression with sticking-plaster, in the manner to be prescribed. If the ulcer be torpid and foul, the limb must be kept in the horizontal position, warm fomentations of decoction of chamomile flowers, or solution of chloride of lime must be used; and when the ulcer has been thereby sufficiently cleansed, sticking-plaster must be applied, according to Baynton's plan. The sticking-plaster, cut in strips of sufficient length, and according to the thread, is to be applied, beginning an inch below the ulcer, in ascending spiral turns, around the ailing part, till the ulcer is completely covered. Over this sticking-plaster, should the leg be swathed to the knee with a linen bandage, in order to give moderate pressure to the whole part, which is especially necessary in varicose or œdematous state of the leg. According to the quantity of the pus secreted by the ulcer, is the plaster to be renewed daily, or after several days, by which the ulcer is properly cleansed; and when scarring commences it is to be touched with a weak solution of sublimate. If the ulcers be accompanied with inflammation, erythism, or with any other complication, they must always be first brought back to their simple condition by preliminary treatment, before proceeding to swathe them in sticking-plaster. If these be attended to, and the sticking-plaster be applied with carefulness, no bad symptoms, no pain, no increased developments of heat, (under which circumstances the part should be moistened with cold water as often as the increased heat seems to require it), no excoriation, nor fresh ulceration, and the like will be observed. If the ulcer, under this treatment, be reduced to a certain point, without seeming inclined to become further healed, or if it again becomes worse, the cause depends either on the insufficient support of the patient, specially in his too early moving about, or there is a general ailment, in causal relation with the ulcer, or the ulcer has become habitual to the patient; and according to these circumstances, the treatment must be directed. I have never observed with this treatment even in ulcers of fifteen or twenty years' standing any symptoms arising from suppression of the usual secretions.

Underwood and Boyer (*a*) allow the patient to walk during the use of Baynton's

(*a*) Rapport en conseil des hôpitaux. Paris, 1831.

swathing with sticking-plaster, and maintain that thereby a more firm and regular scar is produced; as, on the contrary, the scar which is produced whilst the patient is kept quiet, easily breaks out again in standing and walking, on account of the stretching which it suffers in walking.

In these ulcers all the aromatic and astringent remedies have been recommended for local use; bathing the ulcer and its neighbourhood with decoction of oak bark, of willow, of the leaves or shells of walnuts, of the leaves of plantain, of the herbs water-germander, or rue, either alone, or with tincture of myrrh and the like. When the secretion from the ulcer is considerable, it is best to apply the remedies in form of powder, thus, strewing with bark, oak bark, chamomile flowers with camphor, myrrh and the like; or stimulating salves and plasters, digestive ointment with camphor, red percipitate ointment and the like.

When, on account of the peculiar state of the patient, neither rest nor swathing can be made use of, I employ according to the degree of foulness of the ulcer, daily, a foot-bath of chamomile flowers or potash, and bind up the sore with a salve of *ung. nutrit.*, and red percipitate ointment.

Rust (*a*), in chronic ulcers of the foot, employs the hunger-cure, (quarter portion daily), and twice a-week a purge; on the following day a lukewarm bath, and cold fomentations of soft water to the ulcer.

[In the application of sticking-plaster to the ulcers, or indeed when the limb requires support alone, it is much better to put it on in single straps like Scultetus's bandage, than in the spiral way here recommended. The advantage gained is its more close and regular application. As to the frequency of the dressing, I prefer its renewal every day, whether the discharge be much or little, as by the patient's movements it slackens, and does not give the necessary support, unless daily reapplied.—J. F. S.]

763. With this local treatment must be connected internal treatment proportioned to the state of the patient. In weakness and want of tone strengthening remedies must be used; if there be stoppage of the bowels, which is very often connected with ulcers on the lower extremities, purgative and gently strengthening remedies with a regulated diet must be employed. The *gratiola* in suitable doses is advisable in these cases, as well also as when there is no stoppage in the bowels, but a general sluggishness and phlegmatic habit.

764. Relapse after the healing of atonic ulcers are very frequent, especially if the occasional causes be not diminished. They usually break out in autumn or in winter. The best mode of preventing them is perseverance in moderate compression of the foot by a laced stocking of unyielding leather; at the same time a proper diet is to be observed, and every violent motion of the foot to be avoided.

II.—OF SCORBUTIC ULCERS.

Anson, George, afterwards Lord Anson, A Voyage round the World, in the years 1740–4, London, 1748, 4to., contains the best account of Sea Scurvy.

Lind, Jas., M. D., A Treatise on the Scurvy. Edinb., 1753. 8vo.

Hulme, Libellus de naturâ, causa et curatione Scorbuti. London, 1768.

Milman, Sir Francis, Bart., An inquiry into the source from whence the symptoms of Scurvy and of Putrid Fevers arise and into the seat which those affections occupy in the Animal Œconomy, &c. London, 1782. 8vo.

Blane, G., M. D., Observations on the Diseases incident to Seamen. London, 1785. 8vo.

Trotter, Thos., M. D., Observations on the Scurvy, &c. London, 1792. 8vo.

765. *Scorbutic Ulcers* (*Ulcera scorbutica*, Lat.; *scorbutischen Geschwüre*, Germ.; *Ulcères scorbutiques*, Fr.) are always indications of

(*a*) Magazin für die gesammte Heilkunde, vol. ix. p. 517.

more or less developed scurvy. The immediate cause of scurvy is a disposition in the blood and other juices to decomposition and breaking up with predominating weakness of the capillary vascular system. Its symptoms are therefore all grounded on weakness, flabbiness, decay or entire destruction of the contractility of parts, which especially show themselves in the vascular system.

The natural colour of the skin fails, it becomes pale and puffy; the patient feels a general weakness, and tires with the slightest motion. The gums begin to be painful, swell and bleed on the slightest touch; the breath stinks. Upon the surface of the body appear here and there, especially upon the feet, bluish spots of various size, which spread and often enlarge into streaks. In hot climates œdematous swellings of the limbs occur. Mostly there appear on the skin small swellings with bladders, which drop in and are followed by purple-coloured spots. Pains come on in the feet, swellings of the knee-joints, ulcers, and frequent bleedings from the gums. The weakness becomes very great; the patient spits, coughs, and vomits blood; loses blood with his urine and by stool. The gums are often gangrenous; the blood is poured out in every interspace; old scars break out, and the weakness from repeated bleedings is so great that the patient faints on the least movement. He dies either in such fainting or of consumption.

766. Scorbutic ulcers are generally flat, their edges and circumference œdematous, swollen, and bluish; their bottom dirty, beset with fungous granulations, and bleeds on the slightest touch. The ichor flowing from the sore is thin, mingled with blackish blood, and very stinking. The neighbouring bone is often attacked and destroyed. They usually occur on the gums, on the calves of the legs, and thighs, either in distinct patches in severe scurvy, or from other ulcers, if a general scorbutic disposition exist.

767. The occasional causes of scurvy are, want of oxygenated air, moist foggy air, bad food, sluggishness, want of exercise or too great exertion. These causes mostly show themselves after long sea voyages on the coast of the North Sea (*Sea Scurvy*). The influence, however, of similar evil influences may produce scurvy on shore in men of phlegmatic temperaments, who live in damp dull dwellings and feed on bad food. The land scurvy is therefore observed, especially in time of scarcity, in besieged towns and the like. A condition similar to scurvy has been also observed after the immoderate use of mercury.

[The land scurvy here mentioned is the chronic form of *Purpura hæmorrhagica* of Bateman (*a*), who says, that "it appears occasionally, and in its severest and fatal form, where none of these circumstances ever existed; for instance, in young persons living in the country and previously enjoying good health, with all the necessaries and comforts of life. This circumstance tends greatly to obscure the pathology of the disease; for it not only renders the operation of these alleged causes extremely questionable, but it seems to establish an essential difference in the origin and nature of the disorder, from that of *scurvy*, (the true scurvy formerly prevalent among seamen in long voyages), to which the majority of writers have contented themselves with referring it. In scurvy the tenderness of the superficial vessels appears to originate from deficiency of nutriment, and the disease is removed by resorting to wholesome and nutritious food, especially to fresh vegetables, and acids; while in many cases of *Purpura*, the same diet and medicine

(*a*) Practical Synopsis of Cutaneous Diseases. Second Edit., 1813. 8vo.

have been taken abundantly, without the smallest alleviation of the complaint." (p. 110–11.)]

768. The *cure* of scorbutic ulcers requires, before every thing else, the removal of the scorbutic diathesis upon which they depend, by the change of moist foggy air for warm pure air, by the use of better food, especially of acid fruits, by an active mode of life with moving about in the open air, further by the use of *nasturtium aquaticum*, *cochlearia*, *beccabunga*, vegetable and mineral acids, alum, aromatic bitter remedies, as the *calamus*, marsh trefoil, bark, and the like; at the same time rubbing the whole body with spirituous remedies should be advised; even washing with cold water, by which the parts are again endowed with their lost elasticity, and the coagulability of the blood is increased.

769. Upon the ulcers themselves strong astringent remedies are to be applied, bark with alum, camphor, myrrh, alum in astringent decoctions, gum kino dissolved in red wine. THEDEN's arquebusade water, fixed air, charcoal with bark, myrrh, alum, storax, astringent decoctions, with acids. Swathing the limb on which the ulcer is situated with bandages moistened with strengthening remedies is of especial use.

Gargles of bark, decoctions of oak or willow bark, of garden sage with spirit of scurvy grass or alum, and touching with diluted muriatic or sulphuric acid and honey, are the best applications against swellings and ulcers of the gums.

III.—OF SCROFULOUS ULCERS.

KORTUM, C. G. TH., Commentarius de vitio Scrofuloso, ii. vol. Lemgov., 1789–90. 8vo.

WEBER, F. A., Von den Scropheln, einer endemischen Krankheit vieler Provinzen Europa's. Vol. I. Salzburg, 1793. 8vo.

BAUME, J. B. T., Traité sur le Vice Scrofuleux et sur les maladies qui en proviennent. Second Edit. Paris, 1805. 8vo.

BURNS, JOHN, Dissertations on Inflammation. 2 vols. Glasgow, 1800. 8vo.

RUSSELL, JAMES, A Treatise on Scrofula. Edinburgh, 1808. 8vo.

CARMICHAEL, Essay on the Nature and Cure of Scrofula, and a demonstration of its origin from disorder of the Digestive Organs. Dublin, 1810. 8vo.

HENNING, GEO., M. D., A critical Inquiry into the Pathology of Scrofula. London, 1815. 8vo.

HUFELAND, CH. W., Ueber die Natur, Erkenntniss und Heilung der Scrofelkrankheit. Third Edit. Berlin, 1819. 8vo.

GOODLAD, W., Essay on the Diseases of the Vessels and Glands of the Absorbent System. London, 1814. 8vo.

BAUDELOCQUE, A. C., Etudes sur la Maladie Scrofuleuse. Paris, 1834. 8vo.

770. *Scrofulous Ulcers* (*Ulcera scrofulosa*, Lat.; *scrophulösen Geschwüre*, Germ.; *Ulcéres scrofuleux*, Fr.) are indications of more or less developed scrofulous disease. They originate in nutrition varying from the natural type, in consequence of which bad preparation of the blood and unnatural mingling of the lymph, irregularity in the circulation of the latter, obstruction and swelling of the glands ensue.

771. Scrofulous disease is in general a peculiarity of youth; children come into the world with a predisposition to it, and the disease afterwards develops itself especially in bad nursing, want of cleanliness, bad food, and so on. This disposition shows itself under two forms:—

1. The children are sprightly, of slight bodily form, very active, their skin white, their cheeks red, their eyes sparkling and lively, their form beautifully rounded, the hair blonde, brown, fine and curly; they have especially very great excitability.

2. There appear weakness, flabby, lymphatic habit, bloatedness, especially of the face, the lips are turned up, the angles of the jaws strongly prominent. Such persons are slowly developed, suffer from want of nourishment, frequently from *blennorrhœa*, from eruptions of the skin, in which scrofula shows itself in its most revolting form, and its character is torpor.

772. Scrofula when developed gives rise to important diseases; continued inflammation and *blennorrhœa* of the mucous membranes, eruptions of the skin, swelling and suppuration of the glands, atrophy, consumption, swelling and suppuration of the bones and joints.

773. Scrofulous sores occur either when the swollen glands inflame and break, or the skin inflames at various independent spots and ulcerates. They are usually free from pain, their edges hard, irregular, and overhanging; the circumference and the swelling itself are pale or violet red; the bottom is here and there marked with streaks of tough lymph, and the pus thin. Such are scrofulous glandular swellings or a scrofulous habit.

774. The healing of scrofulous sores depends upon the improvement of the constitution, which may be expected if there be no destruction of important parts, and no great accompanying weakness. Scrofula frequently disappears as the development of the body advances, particularly at the time of puberty, and in females frequently at the first pregnancy.

775. The *cure* of scrofula requires especially a good dietetic treatment, strengthening and easily digestible diet, fresh air, cleanliness, and so on. The medical treatment to be employed is either strengthening or such as acts specifically on the lymphatic system: bark, *calamus*, willow or chestnut bark, bitter extracts, acorn coffee, steel, the various mercurial and antimonial preparations, muriate of barytes, *cicuta*, *belladonna*, *dulcamara*, the alkalies, burnt sponge, iodine, cod-liver oil, and so on. The remedies acting on the lymphatic and vascular system are especially suitable in lymphatic habits and large glandular swellings. The remedies mentioned must be differently combined with each other according to the patient's condition, and their favourable operation must be specially supported from time to time by purges of calomel and rhubarb or jalap. The use of the bath, particularly baths of aromatic herbs or wine, sulphur, steel, or salt water, are of remarkable benefit, especially if connected with rubbing of the whole body with flannel or spirituous remedies.

776. Attempts should be made to disperse glandular swellings by friction with volatile liniments, mercurial ointment with camphor and caustic spirits of ammonia; by irritating plasters, the *emp. mercuriale*, *de cicutâ cum ammoniaco*, *saponatum*, with camphor, opium, ox gall, and so on, and when in a very chronic state with iodine ointment. The same remedies are to be used for the dispersion of the hardness generally surrounding scrofulous ulcers. If these swellings be accompanied

with inflammation and pain, the repeated applications of a few leeches is advisable, with mercurial ointment, and the use of dry, or in great tension of moist warmth.

If the scrofulous ulcers have a torpid character, with the astringent decoctions of bark, elm or chestnut rind, and of green walnut shells, must be joined the extract of *cicuta*, *belladonna*, or chamomile; with solution of sublimate or lunar caustic with the above-mentioned additions, with red percipitate ointment, with *ung. nutrit.*, and the like. The scarring is much hastened by frequent touching with lunar caustic, and the removal of the quite loose and overhanging edges of the skin. In inflamed and very painful condition of the ulcer, warm fomentations must be applied over the sore, accompanied with a soothing and corresponding dietetic treatment.

Of late iodine (1) and cod-liver oil (2) have been considered especially important remedies against the various scrofulous affections.

(1) Lugol (*a*) holds that the continued use of iodine is the most certain remedy against scrofulous affections. He has never observed any ill consequence from persisting in the use of this remedy for any length of time; this happens only in the use of the common *tinctura iodinæ*. If oppression at the pit of the stomach come on, the iodine must be put aside, and some ounces of bark wine given.

The forms prescribed by Lugol are,—

℞ *iodinæ* gr.½—¾—gr.j., *aq. destill.* ℔.j.—*M. ut fiat mist; quotidie captand.*

℞ *iodinæ* gr.ij.—iij.—iv. *aq. destill.* ℔.j.—*M. ut fiat lot.; assidueve frequenterve adhibend.*

℞ *potass. iodid.* ℥iv.—v.—vi.. *iodinæ* ℈iv.—xiv.—xvj., *axung. recent.* ℔.j.—*Tere simul, ut fiat ung.; bis die part. affect. infric.*

Besides using these remedies the patient should observe a proper dietic regimen, and be about in the open air.

For baths for children, the solution in the proper quantity of water should be of four degrees of strength; 1, to six ounces of distilled water, two scruples of iodine, and four of iodide of potash; 2, two and a-half scruples of iodine, and five scruples of iodide of potash; 3, three scruples of iodine, and six scruples of iodide of potash; 4, four scruples of iodine, and eight scruples of iodide of potash. For adults, to a similar quantity of water, 1, two drachms of iodine, and four drachms of iodide of potash; 2, two and a-half drachms of iodine, and five drachms of iodide of potash; 3, three drachms of iodine, and six drachms of iodide of potash; 4, four drachms of iodine, and eight drachms of iodide of potash. The fourth degree Lugol does not employ, the third being the strongest he uses.

This, according to Lugol (*b*), is the most efficient and certain mode of curing scrofula, and the conditions depending on it. My own observations, as well as those of other medical men, completely correspond with the advantage of this treatment (*c*).

(2) The cod-liver oil is to be given twice a-day, beginning with one table spoonful, and gradually increasing it up to six; to children it must be given in proportionate smaller doses. To get rid of the filthy taste, the mouth should be rinsed immediately before taking it, with cold water or with brandy, and directly after it is swallowed, a cup of herb tea, of lentain, cinnamon, or Seville orange flower

(*a*) Mémoires sur l'emploi de l'Iode dans les Maladies Scrofuleuses; précédé du rapport fait à l'Académie par Serres, Magendie, et Dumeril. Paris, 1828.

(*b*) Mémoires l'emploi de l'Iode et des bains iodurés

(*c*) Müller, Ueber die arzneiliche Wirkung und Anwendung der Jodine. Würzburg, 1832.

Kunz, Ueber die Anwendungen der Jodine in Scrophulösen Krankheiten nach eigenen Erfahrungen und mit vorzüglicher Berücksichtigung der Versuche und Beobachtungen Dr. Lugol's; in Rust's Magazin, vol. xxxvii. p. 61.

Hanke, Ueber die med. Wirkung des Jods; in Journal von Graefe und von Walther, vol. xxvi. pt. iv. p. 445.

Brera, Saggio clinico sul Iodio, &c. Padua, 1822. 8vo.

should be drank. The external application of the oil in way of friction, is also very efficient for the dispersion of swellings. To be effectual, the oil must be given for a long time. Children always take it willingly, and invariably better than adults, who generally cannot overcome their antipathy to it. After the use of the oil, as well as after the use of iodine, more powerful digestion, better appetite, and even actual voracity, have been noticed. Although chemical observations have given different results as to whether iodine be contained in the oil or not, there appears to be no doubt that the various kinds of oil as met with in commerce, have given rise to the various results, as the true cod-liver oil does contain iodine, but the white oil usually does not, the latter not being cod-liver oil, but seal oil; the former only therefore should be ordered. Hence may be explained the various opinions of numerous physicians on the operation of the oil (*a*).

Fresh walnut leaves and their decoction have of late been particularly recommended against scrofula; two or three cups of the infusion of the fresh leaves daily, with syrup or honey. Also night and morning pills of three and a-half grains of the extract of the leaves, or a table spoonful of the syrup prepared from the same extract, Negrier (*b*). The frequently remarkable effect of Pollini's decoction is to be principally ascribed to the walnut shells it contains.

[Russell observes, that "in the treatment of scrofulous ulcers under the ordinary circumstances of the complaint, the simplest and mildest dressings answer best. When the patients are using a course of sea-bathing, it is usual to wash the sore with sea-water over and above the momentary application of the sea-water during the immersion of the whole body. Cold spring-water is likewise a favourite application with many practitioners; and from much observation, it appears that the operation of cold is well-suited to counteract the state of inflammation which accompanies scrofulous sores." (p. 105). Burns is also of the same opinion as to the use of cold water, but couples it with pressure by adhesive straps. If the sore require stimulating, black wash with or without mucilage of acacia, and with or without tincture of opium, is a very excellent application. But oftentimes these scrofulous sores are quite unmanageable, and will not be soothed or healed with any application. Under these circumstances our entire reliance rests on the improvement of the constitution, simultaneously with which the sores mend.

I scarcely ever use iodine, except as iodide of potash, which is a most excellent medicine, either employed internally or externally. I commonly give from three to five grains of the iodide twice a-day, either in an ounce and a-half of compound infusion of gentian with a drachm of any warm aromatic tincture, or in four ounces of compound decoction of sarsaparilla, and to either vehicle add a drachm of syrup of poppies, which it is well to commence with, as it will generally prevent the *nausea* which frequently occurs without it. Occasionally, after taking the iodide of potash for some days, salivation is produced, which I have observed again and again. And sometimes it disagrees with the stomach and the patient loses appetite and becomes worse instead of better. Under either of these circumstances it must be left off. When used as an oitment, a drachm of the salt to an ounce of lard is a very useful application; more commonly employed, however, to glandular swellings than to sores. It is best applied either simply spread upon lint, or by dressing the surface after the removal of the cuticle by a blister. Either of these modes is preferable to rubbing the ointment in, for frequently when the skin is thin and the patient irritable, after three or four rubbings the skin inflames, the cuticle cracks and it is necessary to withold application to prevent the establishment of a sore.

Some surgeons are fond of painting enlarged scrofulous glands with tincture of iodine, which very commonly blisters the skin; or if it do not, it destroys the cuticle, which flakes off in large pieces. I do not think it a very efficient remedy, though by some so esteemed.

I have given cod-liver oil several times with much advantage; but it is abominably nauseous, and as it owes its efficacy to the iodine it contains, it is certainly preferable to give the iodine in some more agreeable form.—J. F. S.]

(*a*) Brefeld, Der Stockfisch-Leberthran in natur-historischer, chemischer, und pharmaceutischer Hinsicht, besonders aber seine Heilwirkungen in rheumatischen und scrophulösen Krankheitsformen. Hamm, 1835. 8vo.

(*b*) Mémoires sur le Traitement des Affections Scrofuleuses par les préparations de Feuilles de Noyer; in Archives Générales de Medecine, Third Series, vol. x. p. 399. vol. xi. p. 41. (Fourth Series) vol. iv. p. 133.

777. The scrofulous inflammation of the upper lip, nose, and cheeks, which often leads, by ulceration, to considerable destruction, in which the cartilages of the nose shrivel, is, with simultaneous general treatment, not so easily checked and diminished with any thing, as by bathing with decoction of *solanum nigrum*, alone, or with the addition of sublimate or repeated touchings with nitrate of silver. When the scrofula is very inveterate and connected with considerable degeneration, a satisfactory change in the whole body, and a cure, can alone be effected by either of the last-mentioned modes of treatment, by the hunger-cure, by the smear-cure, ZITTMANN's decoction, and the like.

IV.—OF GOUTY ULCERS.

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ROWLY, WILLIAM, The Gout and Rheumatism cured or alleviated. London, 1780. 8vo.

WENZEL, Dissert. de Osseum arthriticorum indole. Mogunt., 1791.

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SCUDAMORE, CHAS., M. D., A Treatise of the Nature and Cure of Gout, &c. Fourth Edit. London, 1823. 8vo.

VON VERING, J,, Heilart der Gicht. Wien, 1832.

778. *Gouty Ulcers (Ulcera arthritica*, Lat.; *arthretischen Geshwüre*, Germ.; *Ulcères arthritiques*, Fr.) are consequent on the existence of gout in the body, with which they are more manifestly or secretly connected. They are usually superficial, their bottom is wide, reddish brown, smooth, contracted, and seemingly very deep, from the wasting of the cellular tissue, and from the union of the skin with the underlying fibrous tissues; they secrete a quantity of serous fluid, which corrodes the parts surrounding the ulcer, and not rarely blackens the linen. Their edges are mostly irregular, pale, and hard, but under inflammation rosy and painful. They become worse periodically, from bad air, or the gouty affections become worse on the incipient improvement of the ulcer.

779. These ulcers occur either from accidental injury during general gouty affections, or after gouty inflammation and swelling, which run into ulceration; they are therefore situated mostly in the lower extremities, and in the neighbourhood of joints. Their *diagnosis* is generally easy though it may be difficult, if the patient, excepting the ulcers, have not suffered any decided gout. In these cases the symptoms must be especially attended to, which usually accompanying anomalous gout, as disturbed functions of the bowels and liver, unnatural urinary secretion, irritating, often periodically wandering pains in the limbs; also *blennorrhœa*, eruptions of the skin and the like, which are often closely connected with the ulcer.

780. These ulcers are generally very stubborn; are often kept up by the disposition of chalky masses; their cure must therefore be undertaken with great care, because the patient is liable to the danger of a metastasis.

781. In treating arthritic ulcers the general affection must always be

attended to. Above all, the patient's mode of living must be specially regulated, frequently the very contrary to the previous course directed, and therefore a change to a diet sometimes with more meat, but more frequently to a more simple vegetable food, with suitable exercise. According to the different character of the gout, means must be employed which either promote or diminish the perspiration and the flow of urine. MINDERER's spirit, antimonial wine, aconite *guiaicum*, camphor, the various preparations of antimony, the alkalies, the *vinum seminis colchici*, and so on; or bitter strengthening remedies, the *calmus*, bark, bitter extracts, steel, or the more opening and purging remedies. Baths, especially those containing sulphur, are of very great use.

The *vinum sem. colchic. autumn.* I have proved to be generally the most efficient remedy against gout and rheumatic affections. The result of my observations and experience on this remedy, that its efficiency depends on the increased production of uric acid in the urine during its use (*a*), has been fully confirmed by the experiments of LEWIN (*b*).

782. The local *treatment* of the ulcer is guided in part by the general treatment. If the ulcer have an inflammatory character, it must, in addition to the removal of all irritants and proper general treatment, be covered merely with a dry warm vegetable poultice; all moist and wet remedies must be avoided. If the ulcer, as is commonly the case, have a torpid character, it must be covered with mercurial or cicuta plaster, with *empl. de minio* with camphor and opium, a powder of bark, camphor, and white sugar is to be daily strewed upon the sore, rubbing in mercurial ointment with camphor around the wound, and swathing the part with waxed taffeta, or the application of camphorated bags of vegetables. SCHMUCHER's plaster of *assafœtida*, soap, *ammoniacum*, and vinegar of squills often does good service, even when there is accompanying exposure of the bone. In this treatment derivation must also be kept up at the same time with issues, setons and the like.

If the ulcers do not heal, their cure must not be forced by contracting and drying remedies. The ground of their stubbornness often depends on local complication; they may be even incurable, if seated in parts which are already completely disorganized.

The earthy masses (urate of soda) often in gout, deposited in the joints, in the cellular tissue, or in the mucous bags, is consequent on repeated inflammation and effusion thereon dependent. If they be in any quantity, the motion is more or less disturbed, and by their irritation, or by a fresh attack of gout, inflammation and suppuration are produced, the skin breaks, and the chalk-like mass is gradually discharged. A dry piece of this substance often penetrates the skin, and remains as an excrescence, without exciting inflammation and suppuration. If the collection of these masses produce inflammation, it must be got rid of by mild treatment. If they be observed beneath the skin, the swelling must be opened; we do not then endeavour to press out the earthy masses; they gradually discharge themselves with the pus, by the continued use of softening poultices. If the inflammation be abated, the removal of the earthy mass may be often facilitated by taking away part of the overlying skin. If a large ulcer be formed with a deposit of this kind at its bottom, it is best removed by the application of caustic remedies, by which the cells containing the earthy matter are destroyed (*c*).

(*a*) Heidel. klin. Annal., 1827, vol. iii. p. 345.

(*b*) ROBERT LEWIN, jun., On the physiological and therapeutical effects of *Colchicum autumnale;* in Edinburgh Medical and Surgical Journ., No. 148.

(*c*) MOORE, J., On Gouty Concretions or Chalk-stones; in Medico-Chirurg. Transactions, vol. i. p. 112.

URE, A., Ib. vol. xxiv. p. 30, recommends especially the benzoic acid, up to a scruple, after mealtime.

OF IMPETIGINOUS ULCERS.

783. Among *Impetiginous Ulcers* (*Ulcera impetiginosa*, Lat.; *impetiginösen Geschwüre*, Germ.: *Ulcères impétigineux*, Fr.) are to be considered those which form, in their course, chronic eruptions of the skin. Hereto belong the herpetic ulcer, the scalled head, milk-crust, and itch. These ulcers are to be considered throughout as symptoms of chronic eruption of the skin, and are determined by the great degree and long continuation of the eruption, by its easy recession from one part, and fixing upon another, or by mechanical influences, itch, and the like.

784. The actual causes of chronic eruptions are, principally, a bad condition of the digestive organs, stagnation in the portal system and liver, disturbance of the secretions, dyscrasy, the use of bad, putrid and acrid victuals and drink, residence in foul air, want of cleanliness, dirty employments, working among wool, acrid remedies and contagion operating on the skin. Hence impetiginous ulcers may be divided into, 1, the simply local; 2, into those which are connected with general causes; and, 3, those originating from contagion.

785. The *treatment* of impetiginous ulcers must vary according to the condition of the ulcer, and the causes upon which the eruption depends. If the ulcers be inflamed and painful, the general treatment must be to diminish irritation and to soothe. A more strict antiphlogistic plan of treatment is indeed rarely necessary; a suitable dietetic regimen, and the use of cooling purgatives, are ordinarily proper. According to the variety of the cause, the remedies to be employed must be sometimes solvent, sometimes for the improvement of the digestion and assimilation, sometimes for the restoration of the suppressed secretions. As in the constitutional, though not contagious eruptions, a morbid matter is produced in a manner thrown off, we must assist its separation by the natural drains, the skin, the urinary organs, and the alimentary canal. The remedies which effect this object are especially sulphur, and its various preparations, antimonials, decoctions of woods, *dulcamara*, sassafras, juniper, sarsaparilla, *carex arenaria*, mezereon, pansy, and the like. In very old eruptions, and in considerable degeneration of the skin, mercurials, sublimate, and arsenic are especially useful; and the cure may often be effected merely by remedies entering into and altering the whole constitution, as the friction-cure, the hunger-cure, Zittmann's decoction and the like, hereafter to be mentioned.

786. The local *treatment* must have special reference to the state of the inflammation, and so long as that continues, mild applications and salves, luke-warm baths and the like can alone be used. If the irritation have subsided, so long as the internal cause is unremoved, the local remedies must be used with caution, because relapse and destruction are easily produced. Sulphur, sublimate, red and white precipitate, alkalies, and the like especially may be used as ointments, solutions, and baths. If the skin be completely degenerated, the application of caustic, and the entire destruction of the diseased part of the skin is often necessary. In this treatment attention must be paid to cleanliness and suitable diet, each of the above-described ailments must be diminished, and a derivation kept up by issues, setons, and so on.

A.—OF HERPETIC ULCERS.

Roussel, H. F. A., Dissert. de variis herpetum speciebus, causis, symptomatibus. Cadom., 1779. 8vo.; in Schlegel's Thesaurus path. therapeut., vol. ii. p. 1.

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Hensler, P. G., De herpete seu formicâ veterum labis venereæ non prorsus experte. Kilon, 1801. 8vo.

Tilesius, W. G., Theorie der flechtenartigen Ausschläge. Ein Versuch zur näheren Bestimmung der chronischen Hautkrankheiten. Leipzig, 1802. 8vo.

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Rayer, P., Traité théorique et pratique des Maladies de la Peau, &c., 2 vols. Paris, 1826–27. 8vo. Ib., Translated into English by R. Willis, M.D. London, 1835.

Schies, L., Dissert. de Lupo. Halæ, 1831.

The Works of Bateman, Schedel and Cazenave, on Diseases of the Skin.

787. *Herpetic Ulcers* (*Ulcera herpetica*, Lat.; *flechtenartigen Geschwüren*, Germ.) are characterized by the following appearances:—at first there is perceived on some part of the skin, inflammation or little bladders, whence are produced crusts or scabs which subsequently either scale off like bran, or fall off in larger pieces, and expose an inflamed patch of the skin, from whence exudes a fluid of peculiar smell and colour, which drying, fresh crusts are produced, and these again fall off. These ulcerations generally do not penetrate deeply, but readily spread on the surface, and are usually accompanied with much burning and itching.

If the herpes spread over a large surface of the body, the perspiration is diminished, the nourishment is disturbed, the action of the bowels stopped, and at last hardening of the bowels, hectic fever, swelling of the feet and so on are produced.

788. Herpes (*Lichen*, *Serpigo*, Lat.; *Flechte*, Germ.) is divided, according to its form, into *Herpes furfuraceus*, *crustaceus*, *quamosus*, *pustulosus*, *phlyctænoides*, *erythemoides*, according as at the onset it is connected with bran-like scales, crusts, pustules, blisters, or inflammation. It is called *eating herpes* (*Herpes exedens*, *rodens*, *phagadænicus*, *Lupus*, Lat.; *fressende Flechte*, Germ.) when the ulceration (generally situated on the tip of the nose, on the cheeks and lips) spread quickly; in this case the parts are eaten away and often considerably destroyed by an acrid fluid beneath a thick scab, or where thick brown or blackish scabs are formed upon roundish sores with bluish edges, dirty colour, and surrounding swelling, which enlarge and eat away the parts without secretion of ichor, as it were by dissolving them. When a pustulous eruption dries to a hard scab upon the hairy part of the chin and cheeks it is called *Herpes mentagra*. The division of herpetic eruptions according to their external form is of little consequence, as they are remarkably changeable.

789. It is uncertain whether the proximate cause of herpetic eruptions consists in a specific dyscrasy, whether it be the same in all herpetic diseases, or whether upon its difference depends the peculiar form of the herpes. Some kinds, especially the eating kind, cannot in its advanced degree be denied to be contagious.

The disposition to herpes which may also be hereditary, depends commonly on a peculiar delicacy and sensibility of the skin, in which usually *Herpes furfuraceus* consists; the herpes mostly shows itself in those parts which are very sensible and are much exposed to the air, therefore especially on the face and hands. The remote causes are frequently stoppages in the intestines of the belly, especially faulty action of the liver, suppression of the natural or long-continued discharges, hæmorrhoids, sweating of the feet, the monthly purification and the like, diminished secretion of the skin and kidneys especially in elderly persons, previous acute eruptions of the skin or acute diseases especially. Further, uncleanliness, neglected cleansing of the skin, irritation of the skin from rough, especially from woollen clothing, or from working among wool; the use of very acrid food and drink. This herpes is often complicated with scrofulous, syphilitic, or gouty affections, and these seem to be its especial causes; although they can be less distinguished by the peculiar form of the eruption and ulcer, than by the general symptoms belonging to them. In hot climates herpes is more frequent than in cold; in our region it is more especially developed in summer; in the winter it often subsides entirely or remains stationary.

From what has been said, it is clear why the repulsion, or imperfect development of herpes, may bring about dangerous symptoms, inflammation and pain in the internal part, spasms, convulsions, apoplexy, palsy, sudden death, stoppage in the bowels, dropsy, consumption, and so on.

Veiel (*a*) has proposed a division of herpes, which is extremely important, both as regards the generic development and the treatment. According to his views, herpetic eruptions are either direct effluvia from the blood or diseased changes of the several organs of the skin. They are in part hereditary, derived from ancestors, and deeply rooted in the organism; in part acquired—that is, are the spontaneous crises of various diseases, as gout, rheumatism, and so on, or diseases consequent on acute and contagious *exanthemata*, as scarlet fever, itch, and so on.

The blood-herpetic eruptions are primarily produced by an apparently fluid deposit beneath or on the skin, as the reflection of disturbance in the mixing of the blood, as the immediate effluvia from the extremities of the blood-vessels. The herpetic eruptions of the skin are secondary changes of the structure of the layers of the skin, produced first of all, by a disease of the actual organ of the skin, in which either the blood selects this organ as a depôt, or in which it is spontaneously diseased. The blood-herpes is usually hereditary, shows itself in the development of the teeth as *Strophulus* and obstinate *Porrigo;* before puberty commonly as scrofula, especially as scrofulous opthalmia; after it, as herpes, and finally as gout. The skin-herpes mostly acquired, occur as consequent of other eruptions, *porrigo*, itch, nettle rash; the blood-herpes, especially *Eczema chronicum* and *Porrigo*, from checking of the perspiration, from the mode of living, and so on. Blood-herpes is variable; it subsides and appears without discernible cause, and spreads suddenly; it prefers the vascular and richly glandular parts of the body, and selects bladders or pustules as its special form. The skin-herpes spreads constantly and obstinately, prefers the extending sides of the joint, and presents itself in scales and imperfect.

The blood-herpes as a semicritical result of deficient mixing of the blood, repelled by external remedies, may produce dangerous consequences from metastasis, whilst skin-herpes, cured by external remedies, has no such dangerous consequences.

(*a*) Ansichten über Flechten in Allgemeinen; in Casper's Wochenschrift für die ges. Heilkunde, May, 1842.

The relapse of blood-herpes commonly arises without any distinguishable cause or disease, especially after influenza; that of skin-herpes after want of food, suspension or perspiration, after rheumatic fever, and so on. Blood-herpes depends, 1, on the quantitative misproportion of the blood: *a*, with excess of albumen, the moist herpes, *Eczema chronicum*, in which a group of capillary vessels pour out serum, whereby the cuticle is raised into bladders which seem to be grouped; *b*, with excess of fibrin the pustular herpes, *Impetigo*, in which serum containing fibrin is poured from the vessels of the *corion* into the tissue, whereby single, cellular pustules are produced: in milk-crust there is only modification from the child's age; *c*, with excess of salts of the blood, the salt flux *Eczema impetiginoides pedum*, in which salt serum is poured forth from the veins of the skin beneath it, which reddens, destroys it, and only on the edges forms distinct vesicles; *d*, with excess of serum, chronic vesicular eruption, *Pemphigus*, chronic nettle rash, chronic tetters, in which an effusion of water in the cells of the *corion* form the tubercles or papules of *lichen*, the tooth-rash, *Strophulus:* 2, on qualitative misproportion; *a*, from itch complicated with *Eczema*, *Prurigo* or *Scabies spuria*, in which not groups of vessels, but only single twigs pour out serum and form distinct, scarcely perceptible vesicles beneath the cuticle; *b*, from the poison of *Tinea*, complicated with *Impetigo*, *Porrigo adultorum mucosa*, little pustules on the skin of the head. Skin-herpes depends, 1, on disease of the glands which form the skin: *a*, there is only a diseased scaly cuticle secreted, without the participation of the dermal tissue in the disease; little herpetic eruptions, *Pityriasis*, *Ichthyosis*, and *Squammositas cutis; b*, an unnatural scale of skin may be deposited on the diseased *corion;* a dry scaly-herpes, *Psoriasis; c*, deposit of unnatural scales on the diseased *corion*, and diseased under skin, and cellular tissue in a circular eruption, *Lepra;* if the cellular tissue be not merely inflamed but degenerated, it is *Elephantiasis;* 2, from disease of the perspiratory glands, *Miliaria chronica:* 3, from disease of the sebacious glands, *Acne:* 4, from disease of the roots of the hair, *Sycosis:* 5, from disease of the subcutaneous cellular tissue; *a*, this gradually shrinks, thereby affects the glands of the skin, so that cuticle exfoliates in a diseased state, finally the *corion* is destroyed, and the entire spot sinks in, becomes smooth, glossy, transparent, forms on the edge little vesicles connected with the subcuticular cellular tissue, which ulcerate superficially; superficial eating herpes, superficial *Lupus; b*, the subcutaneous cellular tissue, suppurates, produces tubercles and pustules, which freely burst through the cuticle, suppurating deep-eating herpes, *Lupus ulceratus; c*, single and, subsequently, confluent tubercles which raise the *corion* and cuticle, the *Lupus hypertrophicus*.

790. The *cure* of herpetic ulcers first requires the removal of the cause. In stoppage of the bowels, laxative and opening remedies are to be given; in diminished secretion from the skin and kidneys it must be endeavoured to reproduce them; in scrofulous, syphilitic, or any other complication, the treatment will direct the contrary; as the mode of living changes if it be in causal relation to the herpes, the mode of living must be especially regulated, in most cases less animal and more vegetable food, but in others more strengthening though always simple diet must be prescribed.

In general the following medicines are anti-herpetic:—antimony, mercury, sulphur alone, or connected with the other; *æthiops antimonialis*, *æthiops mineralis*, *calomel* with *sulphur auratum*, graphit (*a*), iodine, cod liver oil; further, drinks operating on the skin and kidneys, especially if the secretion of urine be sparing or dropsical accumulations have been already produced; decoction of *dulcamara*, of various kinds of woods, the *viola tricolor*, *lign. juniperi*, *cortex mezerei*, *tinctura cantharidis*, and the like. If the skin be very much inflamed, flowers of sulphur, with cream of tartar and *guiaicum*.

791. The *external treatment*, which especially requires attention, and in all cases in which the herpes depends on internal causes, only after

(*a*) Weinhold, K. A., der Graphit, oder neuentdecktes Heilmittel wider die Flechten. Meissen, 1812. 8vo.

previous internal treatment, must be directed by the condition of the ulcers. If these be inflamed and painful, merely lukewarm water and mild salves of fomentations are to be employed. When the inflammation has diminished, sulphur baths, solution of sublimate, the phagedenic water, red or white precipitate ointment, flowers of sulphur, with fat or with soap and water, mercurial ointment, *unguentum citrinum*, *oxygenatum*, graphit salve, a solution of nitrate of silver, and the like are to be used; in old herpetic eruptions the douche with sulphur water, or a blister upon the part of the eruption to destroy it completely, which may be effected by often touching with nitrate of silver. Sulphur with soap and water made up into a liniment and a solution of sublimate I have found more effectual than all other remedies. In this treatment derivation with issues or setons and strict dietetic regimen is always necessary. If symptoms arise from metastasis of the herpes, it must be reproduced as quickly as possible. In habitual herpes, where frequently all remedies are employed in vain, bathing of the part on which the herpes is situated in a decoction of almond bran is very serviceable. In very deep-rooted and wide spread herpetic eruption, when the skin is much changed, the sublimate baths (*a*), the hunger-cure, and ZITTMAN's decoction are very efficient. In such cases, arsenic internally and externally is recommended. The *Herpes exedens* on the face is often alone cured by completely destroying the diseased parts with caustic, and best by HELLMUND's remedy (*b*).

B.—OF SCALLED HEAD.

FRANK, J. P., Epitome de curandis hominum morbis, book iv. p. 87.
GALLOT, L. S., Dissert. sur la Teigne, Paris, 1802.
ALIBERT, above cited, first book.

792. Under the term *Scalled Head* (*Tinea* (*c*) *Capitis*, Lat.; *Kopfgrind*, Germ.; *Teigne*, Fr.) are included the ulcers situated in the skin of the hairy part of the head, covered with crusts of various thickness and colour and accompanied with a secretion of an often peculiarly smelling ichor. Previous to the formation of these ulcers, there occurs a more or less severe smarting, redness and often swelling on some part of the head not unfrequently accompanied with swelling of the glands in the neck and headach. These symptoms increase and then among the hairs are observed sometimes pustules or vesicles, surrounded with an inflamed edge, sometimes circumscribed, pea-shaped swellings, which are white and yellowish at their tip. When these burst an ichorous fluid pours out, mats the hair together, and when it dries forms crusts, beneath which the ichor collects, the skin is destroyed; considerable pain and swelling of the glands of the neck are produced; and usually many lice are generated.

793. According to the different forms of scalled head are distinguished:

1. *Tinea favosa.*—From the little pustules are produced by drying up

(*a*) v. WEDEKIND; in HUFELAND's Journal, 1822. August.
(*b*) RUST's Magazin, vol. xix. pt. i. p. 55.
(*c*) BATEMAN and the modern English writers prefer the genuine term *Porrigo* used by CELSUS to *Tinea* proposed by SAUVAGES.

of the matter contained in them yellowish crusts, often isolated and round, often by running together of considerable extent, with their centre indented, their edges raised, and accompanied with painful itching and secretion of ichor, having the smell of cat's urine. When of long standing all the ulcerated places are covered with thick white crusts, which stick fast, and the intervening skin is covered with branny scales. The ichor collects between these crusts, and frequently destroys the skin even to the bone. Similar crusts are often formed on the face and other parts. If the crusts be removed, the skin is found inflamed, and a clammy fluid exudes from it.

2. *Tinea granulata.*—This is characterized by small, tubercular, irregular crusts, sometimes gray, sometimes grayish, without depression at their tip, usually situated on the upper hinder part of the head, surrounded with branlike scales, and accompanied with a nauseous secretion having the smell of rancid butter or putrid milk. These tubercles, not deeply penetrating in the skin, cause painful smarting, spread very rarely upon some parts of the face, but never on other parts.

3. *Tinea furfuracea.*—Upon the hairy part of the head are formed branny, whitish, more or less thick scales, which are sometimes quite dry, sometimes accompanied with a secretion of a filthy smelling, viscous fluid, and with painful itching. They spread frequently on the forehead, and eyebrows.

4. *Tinea asbestina.*—Commonly upon the fore and upper part of the head, scales are produced, silvery white, glossy, resembling asbestos, which mat the hair together, and cover its whole length, but are accompanied with little pain, and scarcely any secretion.

5. *Tinea muciflua.*—Pustules or little abscesses arise, pouring out when they burst a yellowish viscous fluid, which dries into whitish yellow crusts. A mucoid fluid, resembling spoiled honey, flows out in quantity and mats the hair together. These ulcerations generally spread over the whole face.

794. If the scalled head be of long continuance, or have been neglected, it often produces considerable destruction of the skin of the head, loss of the hair, disturbance of nutrition, suspension of the development of the body, diseased changes of the nails and the like. In *Tinea muciflua* there is often general falling away when the secretion diminishes, and the previous good health only returns when it reappears.

795. Scalled head occurs usually in children about ten years old; but the *Tinea muciflua* commonly shows itself during lactation. Scalled head, however, often also occurs later, especially *Tinea favosa;* but *Tinea asbestina* is peculiar to adults.

The proximate cause of scalled head is an inflammation of the skin, on which the diseased secretion depends, and by the drying up of the secreted fluid the crusts are produced. The occasional causes may be, in children the too great flow of blood to the head, too nourishing food, milk from a debauched, diseased wet nurse, uncleanliness, living in bad damp air, irritation of the head from lice, and its too warm covering; also scrofulous or syphilitic dyscrasies, and contagion, which, though not always, may under certain circumstances occur.

796. Scalled head is in many cases to be considered as a healthy discharge, and its sudden suppression dangerous. The difficulty of curing it depends on the variety of its causes. If it be easily removable, frequently a simple local treatment is sufficient for its cure; but if it depend on a scrofulous or syphilitic dyscrasy its cure is always difficult. It often first subsides at the period of puberty.

797. The *treatment* of scalled head is as various as its causes. The diet, must, therefore, often be changed; attention paid to fresh air and exercise; special cleanliness observed; slightly aperient, diluent remedies, especially purifying the skin, and in scrofulous and syphilitic dyscrasies their antidotes are recommended.

798. The *local treatment* must lessen the irritation, loosen the crusts, and cleanse the sores. This must be effected by frequent washing of the head with softening decoctions, by rubbing in mild salves, fresh butter, sulphur-flowers and hog's lard, by softening poultices of mallows and hemlock. This treatment, with at the same time cleaning the head with combing, or cutting off the matted hair and removing the lice. If the ulcers be obstinate, sulphur ointment must be used, or a solution of sublimate employed. This local, with internal treatment, corresponding to the general state of the patient, and a properly regulated diet, has up to the present answered to my wishes in all cases. Other remedies that have been recommended are, solution of sublimate with verdigris, solution of liver of sulphur, decoction of tobacco, red and white precipitate ointment, *unguentum oxygenatum*, *ægyptiacum*, *citrinum*, solution of sulphate of potash with lime water, soap and spirits of wine, and so on. In very obstinate cases, according to Astruc and others, a plaster of gum ammoniacum and vinegar, thickly spread on leather, and applied for six or eight weeks, will effect the cure. The pulling out the hairs with forceps, or with strips of sticking plaster, is rarely, and only necessary when by their irritation they keep up the sore. The sudden tearing off of a pitch plaster, applied over the whole head, and therewith the sudden removal of the hair is objectionable. When the scalled head has continued a long while, artificial sores must be produced by mezereon, issues, and so on, before the cure can be effected.

C.—OF MILK-CRUST.

Strack, C., De Crustâ lacteâ infantum, ejusdemque specifico remedio. Dissert. altera præm. ornat. Frft., 1779. 12mo.

Wichmann's Ideen zur Diagnostik, vol. i. p. 43.

Autenrieth, Versuche für die praktische Heilkunde aus den klinischen Anstalten zu Tubingen, vol. i. pt. ii.

799. *Milk-crust* (*Crusta lactea*, *Tinea faciei*, Lat.; *Milchborke*, Germ.; *Croûte laiteuse*, Fr.) consists in smarting spreading ulcers, which arise from little vesicles on the cheeks, ears, forehead, or chin; these burst and pour out a yellowish fluid, which dries into white or yellowish crusts. The discharge from the ulceration is sometimes trifling, sometimes considerable. The eruption spreads gradually over the whole face, with which usually inflammation of the eyes is set up, even over

part of the head, the neck, and other parts, and the child wastes in consequence of the continual restlessness.

When this eruption is more moist and eating, great smarting is produced from little blisters like pimples, slightly raised above the skin, and dusky, which soon spreading on the face and other parts, form dusky crusts; and the children, from their continual uneasiness, often waste, become feverish and miserable. The disease is, in this form, called *Crusta serpiginosa.*

800. *Crusta lactea* is generally a disease void of danger, and of indefinite duration, not unfrequently subsides of itself, (in which case the urine is turbid and smells like cat's urine,) and recedes without scarring. It occurs generally in infancy, but also in children from four to seven years of age, and even later. Its causes are too copious nourishment, fulness of humours, (in which cases the disease is salutary, and its quick suppression may cause dangerous symptoms,) bad state of the chyle, teething, and scrofulous disposition.

Crusta serpiginosa is always consequent on a complication of *Crusta lactea*, with a syphilitic or herpetic disposition inherited from the parents, or imbibed by the child from its nurse. It is always a serious disease, may endure long, and produce dangerous symptoms.

Autenrieth, thinks that the itch lies at the bottom of the *Crusta serpiginosa*, and that the latter is an itch of sucking children. This opinion is, in general, unfounded; for itch in its perfect form is often found in sucking children, without *Crusta serpiginosa*, and the latter again may be found without any causal relation with itch.

801. The treatment of milk crust is local and general, and must be guided according to the cause. The food of the child must be changed, the state of the nurse's health improved by suitable remedies, another nurse obtained, or the child weaned if the latter be not possible.

If there be acidity, in the *primæ viæ*, magnesia is to be given; and in scrofulous diseases the remedies antidotal to it. In slight cases this treatment often effects the cure; but if it be insufficient, pansy is to be given, either as decoction of half a drachm of the fresh plant, with milk, morning and evening; or half a drachm of the dried plant in powder, with milk, or mixed with pap. In obstinate cases, or in *Crusta serpiginosa*, the preparations of antimony, of sulphur, or mercury, may be used, cautiously, according to the age and constitution of the patient; as well also as other remedies which purify the skin. In the local treatment care is always necessary, in order not to suppress the secretion too quickly; but after long continuance it must be specially attended to. For loosening the scabs, cream, mild salves, oil, softening decoctions are to be used, and then washing with sublimate water. In great sensibility of the skin and spreading of the ulcers, an ointment composed of flowers of zinc, white precipitate, with olive oil and lime water, a solution of liver of sulphur, and the like. Sulphur baths, also, in these cases do good service.

von Wedekind (*a*) thinks the use of the *herba jaceæ* inefficient. Dabbing the sore twice a-day with sublimate water will always effect a cure, at the utmost in four weeks, without injuring the health. If swelling of the glands, and sores in the neck, remain after the eruption is completely gone, these parts must be carefully washed with sublimate water; but rarely is *æthiops antimonialis* necessary.

(*a*) Hufeland's Journal, 1822, August, p. 27.

D.—OF THE ITCH.

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Vezin, Ueber die Krätze und ihre Behandlung. Osnabrüch, 1843. Second Edit.

802. The *Itch* (*Scabies*, *Psora*, Lat.; *Krätze*, Germ.; *Gale*, Fr.) consists in an eruption of vesicles which, sometimes small and millet-shaped, are filled with transparent fluid, sometimes are larger and filled with thick pus-like matter, somewhat inflamed at their circumference, and mostly at first occuring between the fingers, and on the wrists, and on the joints; gradually they spread over the whole body, and burn and smart severely after the person is heated, or during the night. The vesicles either dry up and crust, (*Dry Itch Scabies sicca*), or they burn and pour out an acrid fluid which corrodes the parts (*Moist Itch*, *Scabies humida*).

If the itch be neglected or suppressed, many vesicles often arise at one part, run together, burst and discharge an acrid ichor, which seizing on the neighbouring parts, considerable ulcers are often in consequence produced, which are covered with scabs; between these the acrid fluid penetrates; their edge is thick, and their circumference covered with itch-pustules (*Itch Ulcers*, *Ulcera scabiosa*). The appearance of these ulcers, the previous existence of the itch, which has been quickly suppressed, or the still existing eruption, render the *diagnosis easy*.

[Krause (*a*) states that itch may exist in persons who wash themselves often, or who have very tough skins, without any eruption; the itching and the power of communication may be present, but no visible sign of the disorder may exist, except the burrows of the insect.]

803. The cause of itch is a contagious matter which can only produce the disease by immediate and somewhat long-continued contact of a person affected with the itch, or by substances, as clothes, bedding, and the like, infected with the contagion. The susceptibility for this contagion varies, but it is favoured by uncleanliness, living in bad air, bad food, and the like; from which circumstances itch is very common in work-houses, among the poor, in dirty hospitals, in certain businesses,

(*a*) Casper's Wochenschrift, July, 1840.—Forbes's British and Foreign Medical Review, vol. x. p. 564.

and so on. As to the *itch-mite* found in the pus of the itch-pustule, and which some consider as the cause of the disease, others as secondarily developed in the itch-pustule, opinions are not yet alike, even after the careful inquiries of late made.

The so-called *False Itch* (*Scabies spuria*, *symptomatica*) indeed resembles the true disease in its appearance; it does not, however, usually first show itself between the fingers, does not smart so much in warmth, is not contaginous, but may be so, and under certain circumstances runs into true itch. In most cases it seems to be a kind of herpes, arises particularly in great uncleanliness, in bad feeding, in living in bad air, after the suppression of the usual discharges in persons who have been subject from early years to stoppage in the bowels, scrofula, or gout, in spring time, and during recovery from inflammatory diseases. On the outbreak of itch other diseases often disappear (*Scabies critica*).

The *itch-mite*, (*Acarus scarabæi*,) which, described formerly (1), and particularly by WICHMANN (*a*), could not be found by others, (BATEMAN, BAKER, CANTON), or has not been considered as the cause of itch, has, by the dispute between ALIBERT and LUGOL, by RENUCCI's observations (*b*) confirming its existence, by the ingenious colonizing experiments which ALBIN GRAS (*c*) instituted, and by the careful inquiries of EBLE (*d*) and others, of late become of considerable importance, as thereby the earlier contradictory statements are put to rights. From EBLE's observations especially, it results that the itch-mite is to be found neither in the lymph nor in the pus of an itch patient, and just as little within the vesicles or pustules; also never in *Scabies pustulosa*, but always in *Scabies vesicularis* alone, and even at that time only just prior to the formation of the vesicle and at its being filled with serum. EBLE in vain employed himself to find them elsewhere than between the fingers and on the wrist; they may, however, occur on other parts of the body. In perfectly round, well-defined and isolated vesicles the mite is sought in vain; but, on the contrary, it is seen in vesicles further advanced, which are only well-rounded and defined on one side, but on the other side have a distinct, dark, grayish, yellow canal, from three-fourths to one line longer, perhaps one-fifth of a line wider, also filled with a little serum, at the opposite blind end of which is found a little wee body, somewhat darker than the rest of the cuticle. If this canal be slit up with a cataract-knife without injuring the dusky body, the mite, a drop of pale serum, usually escapes, and if the back of the cataract-knife be attempted to be brought under the mite, it may be raised and put upon a glass, where it may be ascertained with a simple but strongly magnifying lens, whether you have before you the mite or a piece of epidermis, or dried lymph; for it shows the trunk and very hairy feet which are usually in motion. Under the microscope may be examined all the peculiarities shown by the mite, as WICHMANN had already given them, and the accurate engravings are only to be ascribed to the best microscopes (*e*).

The number of itch-mites has no direct proportion to the intensity of the disease; generally there are but few itch-mites on a person affected with the itch; a hundred may, however, exist on the hands of a patient who has but few vesicles (*f*).

Itch is produced only by the mite and not by the fluid of the pustule, and persons inoculated with pus from such pustules do not have the disease in consequence (EMERY) (*g*). The itch-mite belongs to nocturnal animals, as it only wanders about

(*a*) Aëtiologie der Krätze, Hanov., 1791. Second Edit.

(*b*) Gazette des Hôpitaux. Paris, 1834. Gazette Médicale. Paris, 1834.

(*c*) Recherches sur l'Acarus ou Sarcopte de la Gale de l'homme. Paris, 1834.

(*d*) Ueber die existenz der Krätzmilbe; in Jahrb., des östr. Staates. Neueste Folg, vol. ix. p. 3.

(*e*) RASPAIL, Mémoire comparatif sur l'Histoire Naturelle de l'Insecte de la Gale. Paris, 1834. 8vo.—FRORIEP's Atlas zu Hautkrankheten, book v. pt. ii. Weimar, 1837,—HEILAND, Dissert. de Acaro humans. Berol., 1836. 8vo.

(*f*) GRAS; in Annales des Sciences Naturelles, vol. vi. p. 122.

(*g*) BEHNREND's Allgem. Répertor der ausl. Journaliste, Jan. 1835.—KOHLER in Med. Vereinszeitung, für Preussen. 1836. No. 9, 41.

at night, so contagion appears almost alone to be effected by *sleeping* with an itch patient (Aubé) (*a*).

It is important as regards determining the inoculation of itch by transplanting the mite, that the mite can only be found in the itch which has not been treated with external remedies, although the itch continues; also that single itch-mites may be transferred, but no itch produced, whilst it appears after the translation of a large number (Gras). The number of mites has also no proportion to the number of pustules; they are not found in the pustular form, although that is as contagious as the vesicular (*b*).

[(1) Our countryman, Thomas Mouffet, the author and editor of the *Theatrum Insectorum*, London, 1634, fol., says that Abinzoar or Avenzoar, a Spanish-Arabian Physician of Seville, who lived in the twelfth century, was the first who described the itch-mites as *acari*, little lice that creep under the skin of the hands, legs, and feet, causing pustules full of fluid. He also quotes Joubert, who called them *sirones*, or mites concealed under the cuticle, beneath which they creep like moles, gnawing and causing a troublesome itching. But Mouffet himself saw them, and remarks that their habitation is not in the pustule, but near it; which statement was subsequently proved by Linnæus and Dr. Adams. And he also observes, that they cannot be lice as they live under the cuticle, which lice do not (*c*). Hyacinth Cestoni, at the latter end of the seventeenth century, made a careful examination of the itch-mite; an account of which is given by Bonomo in a letter to the celebrated entomologist, Redi (*d*).

(2) It must not be overlooked that, in 1812, Galès, Apothecary to the Hôpital St. Louis (*e*), made some very extensive inquiries on the subject of itch, and examined with the microscope more than three hundred of these animals, taken from the itch vesicles, which were always of the same form, but had sometimes six, sometimes eight legs, depending, as he believed, on variety of development. He confined one of these mites with a watch-glass upon his hand, and observed it penetrating the cuticle; a few hours after which three vesicles appeared, and the intense itching left no doubt of the disease.]

804. The itch is sometimes more easy, sometimes more difficult to *cure*, but never dangerous under proper treatment. If it be neglected, especially with continued uncleanliness, it often changes its form considerably, so that there are fewer pustules than thick scurf, and various degenerations of the skin, often resembling *Lepra squamosa*, with considerable thickening of the skin and cellular tissue, and extensive ulceration, and as in protracted ulcers, (*par.* 749,) with the symptoms of long-continued general ailing, to wit, loss of appetite, weakness, hectic fever, swelling of the glands, and costiveness. If it be connected with other diseases, as scrofula, syphilis, scurvy, gout, rheumatism, and catarrh, it is always more obstinate and ill-conditioned. If suppressed quickly, asthma, inflammation of the lungs, consumption, dropsy, convulsions, blindness, diseases of the joints, and the like may ensue.

805. In the *treatment* of itch, a *simple* and *complicated* form are distinguished. In simple itch, when in an otherwise healthy person it has existed for a longer or shorter time, it is always to be considered as a purely local complaint, and to be cured merely by local means. Complicated itch being in relation with the above-described general diseased conditions and dyscrasies, their treatment must be attended to.

806. Simple itch is cured by any remedy which destroys the itch-pustule and produces such inflammation in the skin that the cuticle

(*a*) Considerations générales sur la Gale et l'Insect quia la produit. Paris, 1836.

(*b*) Pentzlin, upon *Scabies vera*; in von Graefe und Walther's Journal, vol. xxiv. p. 176.

(*c*) Kirby and Spence, Introduction to Entomology, vol. i. p. 92.

(*d*) Observations sur les Cirons ou Insectes de la Peau des Galeux; in Collect. Académ. Etrangère de Paris, vol. iv. p. 574.

(*e*) Quoted at the head of the Article.

mortifies and is thrown off. On this circumstance may be explained the great number of remedies and modes of treatment recommended for the itch, which only operates when in their composition they have such substances as bring about the above-mentioned effects, or are so energetically rubbed in that the *rubbing itself* produces the same result. Externally, frequent washing with soap and water is recommended, soap baths, frequent change of the washes, and the greatest cleanliness, flowers of sulphur with soap and water, or as a salve with fat, alone or in connexion with precipitate of mercury, white vitriol, extract of lead, with laurel berries, with muriate of ammonia, and the like. Also ointments of manganese, of white and black hellebore, *ung. oxygenatum*, washes of solutions of sublimate, of white vitriol and liver of sulphur, the sulphur fumigation highly valued by Gales and De Carro; the English mode of cure, in which the patient lies naked between blankets and has his whole body rubbed thrice a-day with an ounce of ointment of hog's lard, soap, sulphur, nitre, and hellebore, and is put into a lukewarm bath only at the beginning and end of the cure; and, lastly, the rubbing in of black or green soap.

807. Friction, however, with Horn's liniment and black soap is far preferable to all other modes of treatment. Both remedies are simple in their application, and cheap, and cleanliness can be easily preserved.

Greasy salves are of all the remedies against the itch the most filthy, partly because, especially if they have been long kept in store in the apothecaries' shops, they quickly dry up the itch and *metastasis* is produced; partly because their use is accompanied with much disagreeableness, and the observance of due cleanliness is scarcely possible. The wards of itch patients in hospitals where this mode of treatment is employed, give sufficient proof of this assertion.

808. The liniment recommended by Horn (*a*), composed of one part of flowers of sulphur, two parts of black soap, and as much water as necessary to make a liniment, is to be rubbed in four times a-day to the amount of four to six drachms, on all parts affected with the itch and so smartly that the patient may feel a burning sensation and the diseased skin may spring off; at the same time, also, warm baths and the greatest cleanliness possible.

The strenuous rubbing-in of this liniment, so that the above-mentioned symptoms may be excited, is in no case to be neglected, and therefore also in hospitals the friction is not to be left to the will of the patient, but is to be made under the observation of trustworthy attendants. I have, by attending to this circumstance, perfectly cured in a short time cases of inveterate itch which have withstood various kinds of treatment.

809. Fischer (*b*) has proposed the application of *smear soap* (black or green soap, *sapo viridis*) in the following way:—The patient, quite naked, smears his whole body, in the morning, with from two and a half to three ounces of green soap, then puts on a clean fresh shirt and goes to bed from which he is not to get up till the cure is completed, except to eat and to go to the night-stool; in the evening the same quantity of ointment is to be rubbed in as in the morning. On the second and third days two complete rubbings, each of two ounces, of the whole body are to be made, as well as where the pock and smarting are, as where they

(*a*) Oeffentliche Rechenschaft über meine zwolfjahrige Dienstführung, u. s. w. Berlin, 1818, p. 164.

(*b*) Graf; in Heidelberger klinisch. Annalen, vol. vii. p. 554.

are not. On the fourth day or after the sixth rubbing, the friction is to be continued morning and evening but only on those parts where the eruption and smarting exist; the same also on the fifth and sixth days; and from the fourth to the sixth day no more than four ounces are to be used. On the seventh day, when no more of the eruption and itching are observable, the morning rubbing is to be carefully used, but in the afternoon a general soap bath (of smear soap and warm water) is to be resorted to, which concludes the cure and the patient is to be provided with clean linen and clothes. If after the soap baths a few pocks of itch still show themselves here and there, they must be anointed a day or two longer and the patient must then bathe again. In summer he may be at once set at liberty, but in winter requires a day or two's rest. During the cure no internal treatment is needed, his food must be simple, soup, pulse and meat; his drink, water; the temperature of his room at all times of the year should be from 18° to 21° REAUMUR [= about 72° to 81° FAHR.]

810. The symptoms which occur during this treatment are the following. Some hours after the first rubbing there is tension of the skin with slight burning; gradually the burning becomes more severe and at the third or fourth rubbing so great, that the irritable patient declares he feels as if he lay in the fire. The third day is usually the most painful; the skin is then not merely red and inflamed but elevated into little close-set watery blisters with which the itch pustules become confluent. On the fourth the redness for the most part still remains, the little vesicles become here and there larger, in many parts crack and the skin turns off in plates as in true smooth scarlet fever. The patient suffers in the night only a little smarting. Merely on those parts where the rubbing has been less severe and the inflammation of the skin together with the watery blisters not completely developed, do the old itch pustules partially remain or re-appear. From the fifth to the sixth day, the inflammation, redness, and burning of the skin diminish, and the skin peels in such large masses, that parts of the body an inch broad and long become visible, covered with quite new and perfectly clean epidermis. The sleep is quiet and the patient feels himself comfortable. In the bath the cuticle comes off completely; the new skin is free from eruption and what still remains of the old skin is already destroyed and peels off the next day without further assistance.

GRAF continues rubbing the skin with tallow made fluid every evening, for eight days, for the purpose of removing the tension which sometimes continues in the delicate young skin and to facilitate the scaling of still firmly attached old pieces of epidermis. In eruptions of many years standing, he first orders a purifying medicine of tartar emetic and sulphate of soda; and during the rubbing gives internally two doses of sulphur daily, and rubs in a day or two longer. In cases where, after some years, the itch still remains local, the soap alone is sufficient; but when the above-described general symptoms are present, suitable internal remedies must be employed. In seven days GRAF (*a*) cured an elephantiasis spreading over the whole body.

For the reasons above described the efficiency of this mode of treatment may be judged of, and to it may be added some methods which have recently been recommended as especially efficient. VÉZIN's treatment, a lukewarm bath, in which the patient, standing, is to be rubbed over the whole body with warm water and black soap by means of a piece of coarse woollen stuff, with which care should be taken

(*a*) Above cited.

to rub off the existing itch-pustules and blisters. The patient is then, without further clothing, to be covered up in thick flannel and lie for twelve hours on a mattress provided with a pillow, and covered up, besides the cloak, with a woollen cloth. After the lapse of the appointed time he gives up his cloak and lying down, for the purpose of rubbing in, near the fire, a sufficient quantity of the following salve, *sulph. depur. subtillissime pulv.* ℥j. *rad. helleb. alb. subl. pulv.* ℥ij. *potass. nitr. subl. pulv. gr.* x. *sapon. nigr.* ℥j. *adip. suill.* ℥iij. M., over the whole body and especially on those parts affected with the eruption, after which he puts on his cloak and resumes his former position. After twelve hours, this rubbing is to be repeated, and again after another twelve hours. When the fourth twelve hours have passed, the second and last bath is to be used, in which he remains as long as in the first; and the cure is completed. During the cure care must be taken that the temperature of the sick-chamber should be kept up to 28°–30° Réaumur [= 95° to 100° Fahr.] The patient should then put on clean linen and his previously disinfected clothes. Pentzlin (*a*) uses tar soap, composed of one part of good fat tar, two parts of old salt butter melted together over a charcoal fire, and one part of finely powdered potash shaken into it whilst being stirred; this the patient with the help of an assistant rubs over the whole body without overlooking a spot. After putting on a clean shirt the patient goes to bed and there continues at the second rubbing, which is to be done twenty-four hours after in a similar manner. After the first or second rubbing, the single pustules are observed to shrivel and form a flat smooth crust. Neither irritation nor inflammation of the skin is observed; the patient, however, complains of a disagreeable sensation principally depending on the somewhat sticky nature of the ointment. After the fourth, and at latest after the seventh rubbing all the pustules are seen to be changed into thin, smooth, brownish crusts; the rest of the skin appears smooth and natural. The patient must, however, have a purifying bath of 28° Réaumur [= 95° Fahr.], and after remaining in it some time and careful rubbing, the whole body is, on leaving the bath, to be properly rubbed with green soap, and he is put to bed, where, by careful rubbing kept up with woollen cloths, every thing attached to the skin is removed (*b*).

[In the Belgian army liquid sulphuret of lime is used for the cure of the itch according to the following order:—"Each patient is to be supplied with an ounce or an ounce and a half of liquid sulphuret of lime in a small pot. This quantity he is to rub carefully and slowly with his hands on every part that is covered with papulæ. If there be any papulæ on the back, another patient is to rub the liquid on that part. The operation is to be repeated three times in the twenty-four hours so that each patient consumes three or four ounces of the sulphuret daily. A bath is to be taken every alternate day; the frictions are to be suspended on that day. Fifteen frictions (or ten days' use, are usually sufficient for the cure of the disease, if the medical officer in charge sees that the remedy is properly used. *Preparation of the sulphuret of lime.*—Take of sublimed sulphur 16 lbs. and of quick lime 32 lbs. and boil in 80 lbs. of water for three quarters of an hour. Let the mixture rest for some time until it settle, and then let the clear fluid be decanted off. Boil the residue afresh in about the same quantity of water, treat it in a similar manner, and add this decoction to the first. Usually 140 lbs. of the sulphuret, at 12° by the areometer are thus obtained. If the liquid be more dense, it should be lowered to this standard by the addition of rain water (*c*).]

811. In Complicated Itch the local treatment must be preceded by, or accompanied with the internal remedies in part already mentioned, sulphur alone, or with antimony, purgatives, woody drinks, and the like. If the itch by its long continuance have very much weakened the patient, or if a scrofulous, syphilitic, scorbutic, gouty, or rheumatic dyscrasy exist, the proper remedies for them must be employed.

812. Itch ulcers may be bathed with sublimate water, *aqua phagedenica*, in addition to sulphur ointment, or any of the above-mentioned

(*a*) Above cited.

(*b*) Dr. Serger, Vergleichende Versuche über die Behandlungsarten der Krätze nach Vezin, Fricke, und Pfeuffer; in Würtemb. Correspondenzblatt, 2839, July 29.

(*c*) Braithwaite's Retrospect of Practical Medicine and Surgery, vol. x. p. 115.

salves. If these ulcers be of long continuance, it is advisable to establish issues before stopping them up, which in a very old itch is especially not to be neglected.

813. If the itch be quickly suppressed, we must endeavour to restore the eruption by blisters, by rubbing of tartar emetic ointment, washing and rubbing the skin with irritating remedies, and even by inoculating the itch; at the same time also external remedies acting on the skin, especially sulphur and antimony, must be used.

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Ricord, Traité pratique des Maladies Vénériennes, &c. Paris, 1838. 8vo., and translated into English by H. P. Drummond, M.D. London, 1842. 8vo.

814. *Venereal Ulcers*, *Chancres*, (*Ulcera Venerea*, *Syphilitica*, Lat.; *Schanker*, Germ.; *Chancres*, Fr.,) are distinguished as *primary* and *secondary* (1); the former are consequent on the inoculation of venereal poison and occur at the place of infection; the latter are symptoms of general infection of the body (2).

[(1) The terms *venereal ulcers*, *chancres*, here used indiscriminately by Chelius in reference to both primary and secondary sores, are incorrect. All the sores which result from impure connexion are venereal, in the common acceptation, but all venereal sores are not chancres; therefore to name them chancres produces an erroneous impression of their nature, and should be avoided. The employment of the title, chancre, to sores whether primary or secondary is also improper, for although the primary sore, to which alone English Surgeons, following the authority of John Hunter restrict the name, chancre, may infect the constitution and cause secondary sores and other symptoms, which, together, are by him designated *lues venerea*, yet the matter from a secondary sore will not produce chancre, as proved by Hunter's experiment of inoculating a man who had venereal blotches with matter from his own sores, and also with chancrous matter, in which case the former wounds healed up, but the latter became chancres. It is therefore preferable to give the name *syphilis* to the whole series of symptoms resulting from the communication of the poison of the Hunterian chancre, which is the primary manifestation of the disease, as the ulcers in the throat, the eruptions and sores on the skin, and affections of the bones are the secondary or constitutional results.

(2) John Hunter says:—"The venereal poison is capable of affecting the human body in two different ways; *locally*, that is in those parts only to which it is first applied, and *constitutionally*, that is in consequence of the absorption of the venereal pus which affects parts while diffused in the circulation. * * * The local or first kind is what I have called *immediate*, arising immediately upon the application of venereal pus. Of this kind there are two sorts seemingly different from one another. In the first there is a formation of matter without a breach in the solids, called a *gonorrhœa*. In the second there is a breach in the solids called a chancre. Neither of these two ways in which the disease shows itself is owing to any thing peculiar in the kind of poison applied, but to the difference in the parts contaminated." (p. 24.)

"The most important feature in the natural history of syphilis is," says Lawrence, "the progress of the complaint from one part of the body to another; the succession of symptoms it shows in successive organs and textures; the frequent renewal of the disease in the same organs, or textures, after it has apparently ceased. Some forms of the disease are attended with considerable suffering, great local suffering and considerable constitutional disturbance. When we find that these symptoms are capable of showing themselves, from time to time, in different parts; when we find the disease come on again and again in the same part; when we find that those affections require, as they frequently do, the employment of vigorous and active means of treatment, which exert powerful influences on the animal economy, we cannot wonder that the constitution is frequently enfeebled by the disease, and that in some cases, patients ultimately sink under it. In this point of view, the nature of syphilis is sufficiently serious, though not so serious as formerly supposed." (p. 723-24.)]

815. The operation of the venereal contagion pre-supposes a peculiar delicate structure of the part or a deprivation of its cuticle. Primary syphilitic sores therefore usually arise on the *glans*, and on the prepuce, on the buttocks, on the nipples, on the lips and tongue, according as the infection has occurred from connexion, from suckling children, from kissing, and the like.

816. From two to four days, sometimes longer, sometimes shorter (1), after the communication of the venereal poison in an impure connexion, there appears on some part of the *glans* or prepuce in men, and on the *labia* or *nymphæ* in women, a red inflamed spot, accompanied with a smarting sensation, and usually in men with frequent erection; this rises to a little vesicle filled with pale fluid, which after some time breaks and leaves behind a superficial excoriation; or a hard painful lump arises, which bursting forms a painful ulcer. These ulcerated spots enlarge, have more or less hard everted edges, surrounded with an inflamed edge, and having a foul lardaceous bottom; or they are often covered with scurf, are often very eating, or have everted but not hard edges. They spread more quickly or more slowly in breadth and depth, are more or less painful and inflamed, become sometimes even sloughy, cause considerable destruction, and often even bleeding (2).

The pus secreted by venereal ulcers, is sometimes thin, sometimes of more consistent nature, of a yellowish-white or yellowish-green colour, and makes on white linen, spots like half-melted tallow. Its quantity is always more considerable than from the size of the ulcer might be expected. After healing, scars remain, which have the same size as the previous ulcers.

[(1) John Hunter says:—"I have known cases where the chancres have appeared twenty-four hours after the application of the matter, and I have known them seven weeks. * * * An officer in the army had a chancre break out upon him two months after he had had any connexion with a woman." (p. 232.)

Ricord, in addition to this, observes that "experience has shown him that on the third day of inoculation the pus of chancre became contagious and sometimes even on the second." (p. 540.)

(2) "This like most other inflammations which terminate in ulcers, begins, says John Hunter, "first with an itching in the part; if it is the *glans* that is inflamed, generally a small pimple appears full of matter, without much hardness, or seeming inflammation, and with very little tumefaction, the glans not being so readily tumified from inflammation as many parts are, especially the prepuce; nor are the chancres attended with so much pain or inconvenience as those on the prepuce; but if upon the *frænum*, and more especially the prepuce, an inflammation more considerable than the former soon follows, or at least the effects of the inflammation are more extensive and visible. Those parts being composed of very loose cellular membrane, afford a ready passage for the extravasated juices; continued sympathy also more readily takes place in them. The itching is gradually changed to pain; the surface of the prepuce is in some cases excoriated, and afterwards ulcerates; in others a small pimple or abscess appears, as on the *glans*, which forms an ulcer. A thickening of the part comes on, which at first and while of the true venereal kind, is very circumscribed, not diffusing itself gradually and imperceptibly into the surrounding parts but terminating rather abruptly. Its base is hard and the edges a little prominent. When it begins on the *frænum* or near it, that part is very commonly wholly destroyed, or a hole is often ulcerated through it. * * * The original excoriation or wound may heal although contaminated, and afterwards become a chancre. (p. 233.)

Lawrence observes, that "generally speaking, the process of ulceration in a syphilitic sore is not very rapid; it is rather a chronic kind of ulceration, though there is considerable difference in the various kinds of sores which belong to this disease. Usually speaking, the syphilitic sore is of a circular figure, but not necessarily so. The sores which are produced by the application of venereal poison to the external organs of generation are various in their appearance. We cannot describe one particular character of sore as the result of venereal poison. We find that there are several, all of them seeming to be equally produced by that cause, and yet differing materially from each other in their characters." He divides these sores into five kinds: 1st, the simple venereal sore, (*venerea vulgaris* of Evans,) a superficial ulceration, taking place very commonly on the internal surface of the pre-

puce. Usually there is more than one; generally a sore upon the *corona glandis*, frequently two, three, or four of them, in that situation just behind the prepuce; or such a number may form around the orifice of the prepuce itself. In the first place there is a degree of excoriation from ulcerative absorption; after a certain time the excoriation thus produced is filled up, so that the sore becomes again level with the rest of the surface, the continuation of the reproductive process goes on, and produces an excess of substance in that particular part, so that it projects above the surrounding surface and then the part cicatrizes. These are the stages this sore goes through, and it will often occupy four, five, or six weeks in proceeding through the different stages. It is also very painful, and commonly the surface bleeds when the dressings are changed and the part is exposed. * * * 2d, A venereal sore in which the margin of the ulceration is elevated, and a little indurated; * * * there is a roundish kind of margin; the surface of the sore itself has something in it of a peculiar character, and the discharge from it is scanty in quantity; it bursts and forms a thin scab. 3d, The *indurated chancre*, that is, a venereal ulceration taking place on an indurated basis, so that the margins of the sore and the basis on which it is formed present an unnatural hardness." This is HUNTER's chancre, but LAWRENCE does not agree with his views in reference to the hardened base and edges being essential to the character of a true syphilitic sore. "4th, The *phagadenic primary* sore, presenting the removal of a part by ulcerative absorption; the part has a sharp edge, is sometimes undermined, and the surface is irregular and ragged; there is an eating away, as the term implies, of the textures of the part; there is no formation of granulations; there is nothing like an attempt at the reproductive process, and there is a thin ichorous and very offensive discharge from the sore. Sometimes this phagedenic ulceration extends slowly on the prepuce or *glans*, and greatly destroying those parts; at other times it goes on with much more rapidity; the surface of the sore assumes a livid appearance; there is an ichorous discharge; the ulcerative process goes on, and it frequently destroys the whole of the organ. 5th, The *sloughing* or *gangrenous chancre*, where there is a loss of vitality, and the surface of the sore assumes a dark, black, and manifestly a sloughy appearance. The surrounding parts are highly inflamed in this case; there is considerable redness, swelling, and acute pain; there is also loss of vitality, and the ulcerative surface of the part that has sloughed is separated, and a fresh slough forms over the part; thus the sore becomes rapidly larger and it spreads in every direction, until the part is destroyed by that kind of process constituting sloughing phagedena. * * * This sloughing change is found to take place under two different circumstances. We very commonly see it as the result of neglect and intemperance, in the cases of sores that may not have been sloughy originally, and where persons having primary syphilitic sores take none of the precautions to get rid of them, but continue their occupations and go on with their intemperate habits, causing a high degree of inflammation to be super-induced upon a complaint which is of itself originally of an inflammatory nature; but in other cases the sloughy state is observed from the very first; there is a high degree of constitutional disturbance under this form of change; there is a full and hard pulse, more particularly when it occurs in young robust persons; a white tongue, and in fact the general symptoms that characterize high inflammatory fever." (p. 765–66.)]

817. The pus of the ulcer is the special vehicle of the venereal contagion, the proximate nature of which is unknown, but by its absorption the general *Venereal Disease* or *Pox (Syphilis universalis, Lues Venerea*, Lat.; *Lutseuche*, Germ.; *Vérole*, Fr.) is produced, which is manifested by various signs.

[JOHN HUNTER's assertion that the matter produced in *gonorrhœa* and chancre is of the same kind, and that the only difference is that the one proceeds from a secreting and the other from a non-secreting surface, having been already discussed. (pp. 163, 64,) and clearly refuted by the observations of BENJAMIN BELL, HERNANDEZ, RICORD, and others, does not require further discussion, as it is now universally held that they are two distinct and independent diseases.—J. F. S.

Various experiments have been made as to the effects of inoculating matter from patients labouring under *gonorrhœa*, or chancre, from sores on the genitals, supposed to be syphilitic, and from secondary sores on other parts of the body. Some of

these were instituted by HUNTER with a view to determine the identity of the poison of *gonorrhœa* and chancre, which he considered he proved, though this opinion is now generally held to be erroneous; and also to ascertain whether the matter from primary and secondary sores was the same. But we are indebted to RICORD for having proposed inoculation for the purpose of distinguishing syphilitic sores, whether primary or secondary, from doubtful sores, the situation and character of which might at first lead to the notion of the syphilitic nature, although in reality quite free from that disorder. The following are the very interesting and important observations he has made on this subject:—

"All the natural or morbid secretions of individuals reputed to be syphilitic have been examined by means of inoculation, and one single form has furnished constant results, and that form is, the primative ulcer, otherwise called chancre. The chancre, which is to the constitutional pox what the bite of the mad dog is to hydrophobia, does not produce always a specific pus, but at one certain epoch of its existence, and it is certainly from not having appreciated this so simple fact, that the results of inoculation have been contested or appeared doubtful. It is very evident that the primative syphilitic ulcer cannot be the same at all its periods, and that it cannot arrive at scarring, if it do not at least pass to the state of a simple ulcer, by the destruction of the cause which tended to keep it up; but we must not require from these different phases, similar characters, corresponding results; it is in the period of progress, or of the *statu quo* of the ulceration, whilst there is no attempt to scar, that the chancre secretes the *venereal poison.*

"The specific nature of the chancre is neither grounded in the organ actually ailing, nor in the vitality or functions and sympathetic reactions of this organ, nor yet in relation with the greater or less degree of inflammation which may accompany the ulceration. Its seat has so little influence on the special nature of the chancre, that that disease cannot be regarded, without error, as peculiar to the generative organs. In reality, there is no part of the skin which cannot become its seat; no spot in the requisite condition, and can be voluntarily fixed on, is safe from it; developed on other regions, than the generative organs, it still preserves all its characters without any exception. Thus the chancre of the tip of the finger, of the thigh, of the tongue, of the foot, (if it be not modified,) furnishes pus, inoculable, and capable of producing another chancre *without the participation of the generative organs; whilst no other alteration of these organs is capable of re-producing a chancre, whatever may be its form, its extent, and the degree of the accompanying inflammation.* * * * This fact then is established by experiment, and may the mere speculations of the closet dispute it? The chancre whatever its seat, is the consequence of a specific pus, which it alone secretes, and which as has been so well named *true leven, peculiar ferment, (véritable levain, ferment spécial,)* reproduces an identical disease wherever it is fitly deposited.

"But this particular leven, which has no specific action but when it determines an ulceration, is produced *only during that period of the chancre, which then almost makes, if the expression be permitted, an accidental virulent organ.* In reality as we have seen, the chancre has two very distinct phases; the first, to which the name still belongs, is that of growing or stationary ulceration, it is that which furnishes the peculiar pus; the second is, that of reparation, which only takes place by its passing to the state of simple ulceration, permitting the scarring or transformation on the spot, and furnishing no more specific virulent secretion. It may be imagined how important the distinction between these two periods of chancre is; for without it every thing is confusion, and the same ulceration which inoculated a few days before no longer giving contagious pus. We must decide on the uncertainty of the experiments, where, on the contrary, they are of great value.

"But if we take some of the secreted matter of a chanchre, at the period we have pointed out, and convey it with a lancet beneath the epidermis, see what happens; in the first twenty-four hours, the puncture, as in cow-pox, reddens; on the second or third day, it swells a little, and presents the appearance of a little papule encircled by a red areola; on the third or fourth day, the epidermis, raised by a liquid more or less turbid, takes on a form, often vesicular, presenting on its tip a black point, resulting from the dying of the blood of the little puncture; on the fourth or fifth day, the morbid secretion increases, becomes purulent, the pustular form is decided, and its depressed tone gives it the navel-like appearance which allies it to the pustule of small-pox. At this period the areola of which the extent and intensity

had increased begins to subside or diminish, especially if the disease have not made progress; but after the fifth day, the subjacent tissues, which often have not yet been affected, or have been only slightly œdematous, infiltrate and harden by the pouring out of a plastic lymph which is resistant to the touch, and has the elastic feel of certain cartilages; at last, usually after the sixth day, the pus thickens, the pustule wrinkles, and crusts soon begin to form. If these be not detached, they enlarge at their base, and rising by stratified layers, assume the form of a truncated cone with depressed top. If the crusts be detached, or drop off, an ulcer is found below, seated on a hard base, presenting a ground of which the depth is represented by the whole thickness of the skin, and of which the surface, white, more or less deeply tinged with gray, is formed by a lardaceous, sometimes by a pultaceous matter, or even by a false membrane which cannot be detached by wiping. The edges of the ulcer at this time sharply cut as by a circular punch, are, however, undermined to a greater or less extent, and present under a lens slight indentations and a surface similar to that of the ground; their edge, the seat of a gorging and hardening corresponding to that of the base, presents a kind of ring of a reddish-brown colour, more or less tinged with violet, and which, more prominent than the neighbouring parts, so raises the edges by turning them a little out, as at first gives a funnel-shaped appearance to these ulcerations." (p. 85–90)].

818. *Swellings of the Glands (Buboes) in the neighbourhood of the ulcers*, are in many cases to be considered as the first symptoms of general syphilis. They are caused by absorption of the venereal poison *(idiopathic buboes);* but they may also be the consequence of a consensual irritation attacking them (*sympathetic buboes*). They appear mostly in the glands of the groins, whilst the primary ulcer still remains on the generative organs, and usually when the inflammation in the ulcers is not very great, the ulcer not making progress or even after it has healed. The patient first feels a tension and pressure in the groin, and a hard painful swelling of one or several glands appears which may be pushed about beneath the skin, or is attached to it. The swelling increases, the skin over it reddens, the pain becomes constant, and febrile symptoms are not unfrequently set up. The bubo may disperse, but if the pain be severe and throbbing, its passage to suppuration is certain, when the swelling softens at its top, the skin bursts, and an ulcer is produced, with hard everted edges, and its foul bottom often beset with granulations. Burrowing of pus and considerable destruction frequently take place. Buboes may even in a very high degree of inflammation and under dangerous internal and external influences run into gangrene.

["The true venereal bubo, in consequence of a chancre, is," says John Hunter, "most commonly confined to one gland. It keeps nearly its specific distance till suppuration has taken place, and then becomes more diffused. It is rapid in its progress from inflammation to suppuration and ulceration. The suppuration is commonly large for the size of the gland, and but one abscess. The pain is very acute. The colour of the skin where the inflammation attacks is florid red." (p. 285).

Ricord has ascertained by inoculation that buboes are of seven kinds:—1st, The bubo may be simply inflammatory; *a*, by propagation of the inflammation, without reference to the particular nature of the primary cause of its production, whether a clap, a chancre, or every other lesion; *b*, by sympathetic reflection. 2d, It may be virulent, that is, dependent on the direct absorption of the specific matter of the syphilis, and then it is the strict consequence of chancre, the pus of which can alone produce it. 3d, It may be superficial or deep, or may appear in both forms. 4th, It may have its seat in the cellular tissue, in the lymphatic vessels or ganglions, separately or conjointly. 5th, It may be acute or chronic. 6th, It may be preceded by the other symptoms called primary or it may appear at once. 7th, When other symptoms have appeared before it, it may either follow them immediately, and then be only a successive symptom, or it may present itself at the period of the general symptoms of the pox, and constitute secondary bubo. * * * * Whenever an in-

flammation of the cellular tissue or of the lymphatic system of the inguino-crural or other regions has been consequent on any other cause than chancre, and suppuration has been the consequence, no result has been obtained by inoculation, whatever have been the period and the conditions under which the pus has been taken. Thence, for instance, when a clap has preceded the bubo, and suppuration has occurred, no inoculable pus is obtained; it is only when preceded by a chancre, that a specific pus capable of inoculation is furnished. But it is not sufficient that a chancre should have preceded the bubo, for the latter of necessity to furnish a specific pus; for that purpose the bubo must be neither the result of a simple sympathetic or successive inflammation, but there must have been absorption; but absorption, when it occurs after a chancre of the generative organs, affects only the *superficial ganglions*, and most commonly only one at a time, although more ganglions, either superficial or deep, may be inflamed or swollen at the same time, so that one ganglion actually presents all the characters of a virulent bubo, whilst the neighbouring ones, in which the inflammation has reached to suppuration, as well as the surrounding cellular tissue, present simple and not virulent characters. It was some time before I could well make out these conditions and explain why all the buboes would not inoculate, as those who had repeated my experiments without well knowing them, had asserted; and how it happened that a bubo of which the pus would not inoculate one day would do so on the following; or why in a bubo with separate centres, and which might be called multilocular, one centre furnished inoculable pus and the other did not. I then set about being more exact in my experiments, and first inoculated all buboes, immediately on opening them, with the first pus that escaped, and the result was negative, which explained M. Cullerier's statement, who had perhaps only experimented under these circumstances, or with simple buboes. I then, at two, three, four, five days and more, after opening, took some pus from these same buboes, and then the pus exhibited in many instances positive results, and in others the inoculation continued to produce nothing. In the former case the centre, as well as the edges of the opening, delayed not to take on the characters of chancre, whilst in the latter the abscess followed the course of simple phlegmonous or lymphatic abscess to its cure. An important question then remained for decision, whether in the case where the pus of the bubo had not inoculated at the instant of the opening, it had not acquired its inoculable quality by contact with the air, or by the external mixture, after opening with the pus of a pre-existing chancre, or in some other manner. The solution appeared very difficult, when a patient came to me with a bubo following a chancre, and with large suppuration. I opened the abscess, but after having discharged the pus from the cellular tissue, I found in the middle of its centre a very large lymphatic gland fluctuating in its centre. This I opened, and with the pus it contained made an inoculation, and at the same time a similar one with pus from the neighbouring parts, that is, from the cellular tissue; and whilst the pus from the ganglion produced the characteristic pustule, that from the cellular tissue produced nothing. * * * The same results were obtained by pus from the course of the lymphatic vessels. * * * But as to the deep ganglionic swellings called deep buboes, when they suppurate, which is much more rarely than the superficial, the pus furnished from them never inoculates, unless in a purulent deposit, they are found after the cut bathed in the pus of a neighbouring chancre or by an infected superficial ganglion; but never in this case are the deep ganglions infected by absorption." (p. 62–6; Fr. edit., p. 138–146).

Upon the question of the existence of syphilitic buboes, without primary sore, Hunter speaks with caution. He says, indeed, "the first and most simple mode (of absorption) is where the matter either of a *gonorrhœa* or chancre has only been applied to some sound surface without having produced any local effect on the part, but has been absorbed immediately upon its application." But almost immediately after he observes:—"It must be allowed that this mode of absorption is very rare; and if we were to examine the parts very carefully, or inquire of the patient very strictly, probably a small chancre might be discovered to have been the cause, which I have more than once seen." Another concludes, "there is, however, no great reason why it should not happen." (p. 274). From these observations it is quite clear that Hunter's mind was not satisfied upon this point.

Ricord has also inquired into this subject, and observes:—"If, however, it be true, that after suspicious sexual connexion, the enlargements of the neighbouring ganglions of the generative organs become rarely primarily affected, there are, how-

ever, circumstances in which it is impossible to find any suspicious antecedent or concomitant, and then we are forced to admit a primary bubo (*bubo d'emblée*). When these enlargements are carefully examined without our being led into error by those which may resemble them, we find that they most commonly appear in the deep ganglions, and as frequently, even in those of the iliac *fossa*, or at least in the sub-aponeurotic ones of the thigh; that their course is often chronic; that they are long indolent, and have little disposition to suppurate; but it is very remarkable, that when they do suppurate, the pus they produce will not inoculate: never as yet have I found a bubo embracing all the positive signs of an immediate bubo which produced inoculable pus. If to this important observation be added, that after the exact researches which I have made, I have never found that immediate buboes, in the strict sense of the word, have been followed by general symptoms of pox, the importance of inoculation in this case will be evident." Hence he concludes, that "a virulent bubo, or that from the absorption of the pus of chancre, is a symptom in every respect analogous to chancre as to its nature, and only differs in its seat; that virulent bubo is the only one which will inoculate; that the signs indicated by authors for distinguishing virulent bubo from the enlargements with which they are confounded, without exception, in the greater number of cases, serve only to establish a rational or probable *diagnosis*, and that inoculation alone can be considered as the indisputable ond pathognomic sign; and that if in a greater number of cases the precise *diagnosis* of a bubo were not absolutely necessary to direct the treatment and to form a *prognosis* of the coming chances to the patient, when there is question of a *bubo being immediate*, we should never neglect when suppuration has taken place, to examine it at every stage of its course, careful examination, close observation having proved that buboes which do not inoculate (when the experiments are properly made) are never followed by secondary symptoms, and that they also are not syphilitic; whilst from other causes which often escape us, and without needing the pox, may give rise to enlargements of the lymphatic system of one region of the body as well as another; and that it would therefore be absurd to conclude that a bubo is necessarily syphilitic because it had appeared a short time after connexion." (p. 67–9; Fr. Edit., p. 148–51.)]

819. If the disease be general, it attacks especially either the *skin*, *mucous membrane*, or *bones*. The length of time from the origin of the local syphilitic symptoms to the outbreak of the general venereal disease is different. Usually it occurs six weeks after the primary syphilitic affection; a longer as well as a shorter space of time may, however, be observed. The attack of the *masked syphilis* (*lues larvata*) can only be properly applied to this period, when, with a seeming cure of the primitive syphilitic affections, up to the outbreak of the general disease, no decided symptoms are manifest. The appearance of the general syphilis is mostly accompanied with slight fever and with burning heat in the palms of the hands.

["The venereal matter," observes JOHN HUNTER, "when taken into the constitution produces an irritation which is capable of being continued independent of a continuance of absorption; and the constitution has no power of relief: therefore a *lues venerea* continues to increase. This circumstance is perhaps one of the best distinguishing marks of the *lues venerea*; for in its ulcers and blotches, it is often imitated by other diseases which, not having this property, will therefore heal and break out again in some other part; diseases in which this happens show themselves not to be venereal; however, we are not to conclude because they do not heal of themselves, and give way only to mercury, that therefore they are venereal, although this circumstance, joined to others, gives a strong presumption of their being such." (p. 320.)]

820. *An Inflammation in the Mucous Membrane of the Throat* most commonly shows itself as a seeming catarrhal affection, with stoppage in the nose, difficulty in swallowing, hoarseness, snuffling speech, and tears in the eyes. On internal examination of the throat, the mucous

membrane is found reddened, the tonsils and *uvula* swollen; the redness, specially fixed on certain spots, is on others pale and discoloured. These places break up and run into ulcers, which are sufficiently characterized by their peculiar appearance. Vesicles often arise on the inside of the cheeks or at the corners of the mouth, which sometimes run into ulcers. These sores spread quickly, destroy the pendulous palate, attack the bones of the nose, produce a stinking secretion from it, (*Ozæna syphilitica,*) *caries*, and destruction of the nose-bones.

821. On the external skin syphilis appears as *blotches*, (*Maculæ*, Lat.; *Flecken*, Germ.; *Taches*, Fr.,) *vesicles*, (*Vesiculæ*, Lat.; *Blätterchen*, Germ.; *Vésicules*, Fr.,) or *pustules*, (*Pustulæ* Lat.; *Pusteln*, Germ.; *Pustules*, Fr.,) which are especially common on the face and forehead, (*corona Veneris*), and at first have a pale but subsequently a copper-coloured redness. The pustules are surrounded with a reddish brown edge, are sometimes single, sometimes collected in groups; they often produce considerable burning, especially at night, and frequently run into ulcers which have purple edges, and secrete an ill-conditioned ichor; they usually increase only in breadth, though often in depth, and even attack the bones. If pustules occur on hairy parts, the hairs fall off; if beneath the nails, these fall off also, or are loosened by the ulcers, and the fresh growing nail is misshapen. These pustules often appear in form of small boils, which do not suppurate, but merely trickle.

[Lawrence describes four forms of cutaneous syphilitic eruptions: "1st, The scaly eruption is one of the most common. The skin before the eruption appears exhibits a kind of mottled or marbled appearance all over the body. If you strip the patient, though the skin is seen in the natural state, yet there is a streaked or mottled appearance underneath; there are little patches of red appearing through the cuticle, which give it that appearance. Very soon you observe spots of a reddish brown, or what would be called a coppery colour on the skin; and this has always been the marked character of venereal eruption. This reddish-brown superficial discolorations of the skin soon become more deeply coloured. The cuticle covering them desquamates a little, becomes scaly, and the cuticle separates. The spots increase in size; they often run together, so that you have considerable patches of the skin in various parts of the body assuming this colour. In the end these discolorations generally are large in size and particularly vivid. They have a bright coppery-red colour, and the cuticle over them becomes very scaly. They are very strongly marked when they occur in the palms of the hands and soles of the feet; then the contrast of the colour of the diseased with the healthy skin is very strong; and the cuticle being thick, cracks and assumes a whitish appearance, and what would have come under the description of that which Willan and Bateman call *syphilitic lepra* or *syphilitic psoriasis*. 2d. Very frequently syphilitic eruption exhibits itself in the tubercular form. In the scaly form just mentioned, the discoloration is superficial, and the coppery red spots do not rise above the level of the surrounding sound skin, but in the tubercular eruption you have a small kind of eruption with the point more raised, and as that proceeds, the cuticle goes into the scaly state, so that that is in fact a scaly eruption, although there is a tubercular elevation of the cuticle in the first instance. 3d. In other cases there is a more acute action of the skin—active inflammation, with the formation of inflamed pimples, or of *papulæ*, as they are technically termed. These arise in clusters and patches in various parts of the body; after remaining for a time, they vesicate and suppurate, and that suppuration dries up, and they go into a scaly state, and you have a succession of those pimples forming over various parts of the body; this is called papular venereal eruption. 4th, There is another form in which you see it, where pustules, that is, inflammation of the skin, takes place, effusion occurs, and the cuticle is elevated into inflamed pustules; these proceed and form venereal ulcers, that is, the pustular venereal eruption. These are the principal forms of eruption, observed as secondary symptoms of syphilis; a scaly eruption which may

be called *syphilitic lepra* or *syphilitic psoriasis*, a tubercular eruption, a papular eruption, and a pustular eruption proceeding to ulceration. Now you do not find these eruptions always distinct; frequently they are so, but sometimes the different characters of the eruptions are united; that is, you will find an eruption partly pustular and partly scaly. * * * The pustular eruption spreads into ulcerations; the cuticle, which has been elevated by lymph or pus, gives way, and the fluid which is discharged incrusts upon the surface. The skin ulcerates under that incrustation; a greater discharge of matter takes place, and the incrustation is increased. If the parts be kept moist, an ulcer is seen; but if less exposed to the air, the matter concretes, and the part is covered with incrustations more or less thick. The ulcerations thus formed are superficial sores, generally of a circular shape and rapidly healing. In other instances they degenerate into very foul and intractable ulcerations of a phagedenic character. Very generally they retain the circular form and heal up in the centre but not towards the edges; there is a healing up in the centre and a very foul or tawny margin by which the ulceration extends. Frequently the sores are of a crescent shape, that is, they have a convex edge by which they extend, whilst they heal up at the concavity. Sometimes the phagedenic edge is simply of a tawny colour; at other times it is considerably elevated and almost sloughy, with a very red, angry, and fiery state of a neighbouring skin. There is a considerable variety in the characters of these syphilitic ulcerations of the skin, all of which originate, in the first instance, from a vesicle or pustule." (pp. 773, 74.)]

822. Syphilis often produces on the skin a more herpes-like eruption, which exfoliates like scales, especially in the hollows of the hands, (*Rhagades*,) on the thighs, in the neighbourhood of the generative organs, on the buttocks. The skin also frequently has cracks, with copper-coloured, callous, painful edges, from which an ill-coloured acrid fluid is poured out. Or there arise, most commonly on the generative organs and the rump, *Growths*, which according to their different form and consistence, have various names, as *Warts* (*Verrucæ*,) *Fig Warts*, (*Condylomata*, *Fici*, *Mariscæ*, &c.,) with which are frequently connected ulcers on the generative organs, discharge of *mucus* from the *urethra vagina*, and so on (*a*).

[John Hunter first noticed the difference between the pus from a primary and that from a secondary syphilitic sore, and not admitting that though mercury cure both kinds, both were necessarily the same in their nature, "as mercury cures many diseases besides the venereal. On the other hand there are many strong reasons for believing that the matter is not venereal. There is one curious fact which shows it is either not venereal, or if it be, that it is not capable of acting in some respects on the same body, or on the same state of constitution, as that matter does which is produced from chancre or *gonorrhœa*. The pus from these latter, when absorbed generally, produces a bubo, but we never find a bubo from the absorption of matter from a pocky sore; for instance, where there is a venereal ulcer in the throat, we have not buboes in the glands of the neck; when there are venereal sores on the arms, or even suppurating nodes on the ulna, there are no swellings of the glands of the arm-pit; although such will take place if fresh venereal matter is applied to a common sore on the arm, hand or fingers. No swelling takes place in the glands of the groin from either nodes or blotches on the legs and thighs. It may be supposed that there is no absorption going on from such sores; but I think we have no grounds for such supposition. Its mode of irritation, or the action of the parts affected, is very different from what happens in chancre, *gonorrhœa*, or bubo being hardly attended with inflammation, which in them is generally violent." (p. 512.) He then mentions some experiments made with the matter of secondary syphilitic sores on the skin, and on the tonsils, but from neither was any chancrous sore produced.

(*a*) Albers, Ueber die Erkentniss und Heilung der syphilitischen Hautkrankheiten. Bonn, 1832.

Humbert, Manuel pratique des Maladies de la Peau appellées Syphilides. Paris, 1833.

Martins, Mémoires sur les causes générales des Syphilides (extr. de la Révue Médicale, vol. i. 1838.) Paris, 1838.

The truth of Hunter's opinions and observations on this interesting question has been of late fully confirmed by the experiments of Ricord, who says that he has thus arrived at the conclusion "that all reputed secondary phenomena are far from being specific; that infection by the venereal virus may excite in the economy disorders, lesions, the development of morbid symptoms analogous to those produced by any non-specific cause; but that independent of these, perhaps most common symptoms, and which afford a deceptive support to the doctrine of non-specificity of pox, or of the non-existence of the virus, there are certain regular characteristic symptoms occurring as necessary and sure consequences after the primary infection, and which are the result of chancre, under one of the forms already mentioned, or the product of inheritance, which military surgeons can only deny from want of a proper field of observation. When we have followed the pus of a chancre, in its penetration into the economy, if I may be so allowed to express it, we have seen that whether it was merely by imbibition of the cellular tissue, to whatever depth it might reach, it still preserved its characteristic property, the capability of inoculating: that it was the same with the afferent lymphatics, from the chancre to the first ganglion, in which they terminated, and that beyond this point, where first began the mixture with the circulation and other organic matters by this kind of ganglionary digestion, which takes place in the lymphatic system, the pus underwent a transformation which, without depriving it of its specificity as regards the symptoms it produces in the economy, takes from it the power of inoculating: that it was only by virtue of this modification that this *syphilitic temperament* could be established, to give place more slowly to the diathesis for the development of secondary symptoms: that without traversing the lymphatic system this result was the strict consequence of venous absorption; the symptoms of constitutional pox not requiring for their manifestation, the passage of the virus by the lymphatics and the previous production, in all cases, of buboes." And hence he arrives at the conclusions, *First*, That though one symptom does not inoculate, it is not therefore to be said that it is not syphilitic, because the virus modified by venous absorption and susceptible of poisoning the economy, loses this property whilst it preserves alone that of propagating by inheritance. *Secondly*, That whenever a symptom, whatever its seat and apparent form, inoculates, it is necessarily the product of direct contagion and not the result of general infection depending on absorption from one to another part, and does not actually indicate the *venereal temperament* or in common terms constitutional pox." (p. 74–7; Fr. Edit., p. 162–67.)]

823. The *Syphilitic affection of the Bony System* is manifested by nightly pains, which are boring and gnawing, and situated, especially in tubular bones, and in such bones as are covered with least soft parts, as shin-, arm-, breast-, collar-, and skull-bones. These bones, especially those of the shin and skull, swell up, in which latter case the bony swellings usually precede or are accompanied with severe headach. The bony swellings are often soft, and formed by a jelly-like mass poured out beneath the *periosteum*, (*Gummata*,), often hard and immovable, (*Nodi*, *Tophi*, *Exostoses*,) and frequently contain a chalky substance. Not unfrequently the bones swell very considerably; inflammation often takes place, and expansion of the medullary cavity of the tubular bones, (*Spina ventosa*). If these bony swellings inflame and run on to ulceration, dangerous eating away of the bone (*Caries syphilitica*, Lat.; *Knochenfrass*, Germ.) occurs. But commonly by the destruction of the soft parts and of the *periosteum* the bones are laid bare to a great extent, killed, (*Necrosis*), and thrown off in larger or smaller pieces (*Exfoliates*). Very frequently also in general *Lues* inflammation of the joints and its consequences takes place.

824. If the *Leus* have advanced considerably, hectic fever, complete disorder of the digestion, exhaustion, and death, may be produced by the tormenting pain, and by the great loss of the juices from the suppurating parts.

825. Syphilitic symptoms are subject to various modifications, which do not depend on a *variety* of the syphilitic poison, but on the constitution and age of the patient, on the mode of its reception into the body, on climate and other circumstances, on the existence of other diseases, but perhaps also on a qualitative change of the poison, which it suffers in insufficient treatment. The stronger and more powerful the person is, so much the more speedy in its course and destructive is the syphilis. In warm climates the general symptoms of syphilis are milder, it attacks rather the skin and its processes and the cellular tissue; in cold climates, on the contrary, it attacks rather the bony system; in warm climates, however, there may be noticed great severity of the primary symptoms, in which case severe inflammation follows, and runs into mortification. This disposition to erysepilatous inflammation and mortification in primary syphilitic ulcers is observed frequently in bad, tainted, and marshy air. The scurvy, or a similar affection, after too frequent use of mercury, scrofula, gout, and rheumatic affections, may produce different variations of syphilis from its usual course, and thereby render *diagnosis* difficult.

Primary syphilitic ulcers have especially no decided external character; they have a very varied appearance, and cannot, at a mere glance, be distinguished from such ulcers as are of a more common or totally different nature.

["It cannot, I think, on due consideration of the subject, be denied," says ABERNETHY, "that many sores are induced on the genitals, by sexual intercourse, which are not the effects of the venereal poison, and that many of them infect the constitution, and produce secondary symptoms resembling those of that disorder. It may be asked, however, if these diseases be not venereal, what are they? As they are all the consequence of sexual intercourse, they may, in one sense of the word, be said to be venereal. To avoid ambiguity, therefore, I shall denominate that disease which broke out at the siege at Naples, and which Mr. HUNTER has described as the venereal disease by the name given to it by nosological writers, that is, syphilis; and I shall call those diseases, which differ from it in their progress and mode of becoming well, though they strikingly resemble it in appearance by a name importing these circumstances, that is, pseudo-syphilitic diseases." (pp. 2, 3.) He then proceeds to some observations on the probable origin of the latter complaints, and mentions that "CELSUS describes eight species of sores with which the genitals were affected in consequence of sexual intercourse; and as this was long before syphilis was known, it follows that there must be other causes producing them. Some of the sores described by CELSUS are not unfrequently met with at present, and they are not syphilitic. Sores also frequently form upon the genitals of females, in consequence of that irritation which accompanies diseased secretions from the *vagina*. Sores, for instance, very frequently succeed to *gonorrhœa* in the lower class of females, who pay little attention to cleanliness, and do not abstain from sexual intercourse. Sores frequently break out on the prepuce and *glans* of the male, in consequence of the irritation which *gonorrhœa*, or other diseases of the *urethra* produce in these parts. These sores generally heal without mercury, frequently without inducing any constitutional disease; and when they do affect the constitution, the disease occasioned by them is not syphilitic. I merely mention these circumstances at present to show that it is possible for ulcers to form which may not be syphilitic, and yet the discharges from them may prove morbific, and produce disease in others. Even discharges from the genitals of one person, where no ulcers exist, are capable of exciting ulcers in another." (pp. 4, 5.) He further observes, that "the primary infected sores, which are capable of producing secondary symptoms, strikingly resembling those of syphilis, do not themselves possess any uniform characters." (p. 40). And he thinks "it is probable that the morbific poisons which produce pseudo-syphilis, may be absorbed without any evident ulcer,

or from a trivial ulcer, which may heal spontaneously, much more frequently than the syphilitic poison." (p. 41).

As regards the mode of distinguishing the false from the true disease, ABERNETHY says:—"I have not been able to discover any (appropriate characters); the fictitious disease, in appearance, so exactly resembles syphilis, that no observation, however acute, seems to be capable of deciding upon its nature. Although the ulcers in these ambiguous cases generally spread more extensively along the surface of the part which they affect, yet this does not constantly happen. * * * It must also be remarked that true syphilitic spots and ulcers sometimes assume the appearance of other diseases, and do not possess their ordinary characteristics. Since then our senses fail us in our endeavours to discriminate between these two diseases, and since the most important circumstance is to distinguish whether the disease be syphilis or not, we may inquire whether there are any circumstances in the progress of these different diseases which will serve us in distinguishing one from the other. It appears to me that there are. * * * A very simple fact has enabled me in most cases to distinguish between the two diseases; yet simple as it is, if it be generally true, it is very important; and if it were universally true, it would be of the highest consequence. The fact alluded to is that *the constitutional symptoms of syphilis are progressive, and never disappear unless medicine be employed.* It may be added too, they are as generally relieved under an adequate effect of mercury on the constitution." (p. 45–7).

ABERNETHY further remarks, that "Mr. HUNTER thought that syphilitic poison might produce a sore which might be modified by the diseased propensities of the constitution and the part, and thus lose its distinctive characters." And further:—"If, according to the opinion of Mr. HUNTER, the action of a syphilitic chancre may be so modified by the diseased propensities of the constitution or part, as to form an ulcer scarcely cognizable as a syphilitic one, it follows &c." (p. 59, 60). Where this opinion of HUNTER's is to be found, I know not, for I cannot meet with it in his work on the Venereal Disease; and the only passage at all like it is the following:—"Chancres, as well as the *gonorrhœa*, are perhaps seldom or never wholly venereal, but are varied by certain peculiarities of the constitution at the time." (p. 242). It must not, however, be omitted, that the last part of this work is occupied with observations "of diseases resembling the *lues venerea*, which have been mistaken for it," and that he closes his book with the observation "that undescribed diseases resembling the venereal are very numerous, and that what I have said is rather to be considered as hints for others to prosecute this inquiry further, than as a complete account of the subject."

CARMICHAEL objects to the use of "those common but arbitrary terms syphilitic, syphiloidal and pseudo-syphilitic" (p. 48) diseases, which he regards as "an endeavour to conceal our ignorance by the adoption of plausible and delusive epithets and appellations." (p. 47). And remarks, that "as long as syphilis is the name attached to a certain form of venereal complaints, we shall never escape from the terms pseudo-syphilis, syphiloidal symptoms, and *sequelæ* of syphilis. The first is an arbitrary term applied to a congeries of symptoms upon the nature and extent of which scarcely two practitioners are agreed; and, therefore, when one person calls a complaint syphilitic, another disease altogether different may be presented to the mind of the person he addresses. Pseudo-syphilis is equally objectionable, as it is too general a term for any useful purpose, inasmuch as it embraces not only all those venereal complaints which do not correspond to HUNTER's description of syphilis, but all those spontaneous disorders which have no pretension to a venereal origin, and are solely attributable to some derangement of the constitution. The term syphiloidal symptoms and *sequelæ* of syphilis imply that there is but one venereal poison, an opinion which I conceive to be absolutely refuted." (p. 66).

Without, as seems to me, any very satisfactory reason, CARMICHAEL founds his arrangement of venereal complaints on the character of the eruption. He says:—"In arranging under distinct heads the numerous appearances and symptoms produced by venereal complaints, I would follow the same rule which has hitherto guided the judgment of the profession in arranging and classifying all other morbid poisons attended with eruptions. In other words, I would regard the eruption as the most proper basis of the arrangement; and, without neglecting such auxiliary evidence as other attending symptoms may afford, consider them as of minor importance in determining the nature of the disease. By following this method, it is truly gratify-

ing to find how easily the numerous symptoms, both primary and constitutional, of venereal diseases, which are so various as seemingly to bid defiance to any attempt at arrangement, can be disposed of in their appropriate places under the name of the eruption which belongs to their respective species. Next to the eruption the symptom most to be regarded is the primary ulcer, whose characteristics are in general found sufficiently distinct to enable us to foretel with tolerable certainty what the appearance of the eruption will be." (pp. 62, 3). Now, if such be the fact, as it most undoubtedly is, there does not seem good cause for taking the eruption, which is the second, and indeed not unfrequently the third form of the disease, and which frequently never appears at all, as the foundation of the arrangement of diseases which commonly do not, if properly tendered, proceed beyond the primary sore, of which sore CARMICHAEL says, "the characteristics are in general found sufficiently distinct," which sore must always have occurred prior to the appearance of the eruption, and is the condition of the peculiar eruption, although not necessarily followed by the outbreak of any eruption, as indeed CARMICHAEL admits:—"On a loose computation, it may be regarded that nine out of ten of primary ulcers are not attended by constitutional symptoms; so that in a great majority of cases the disease has never arrived at the stage to which it is indebted for its name. To this objection I reply, that the primary ulcers afford a less decisive means of determining the nature of the disease than the secondary; yet from their characters when unaltered by irritation or mercury, we may discriminate their nature with sufficient certainty to decide on the precise eruption they would produce in their secondary state." (p. 68). These observations, on his own showing, seem to prove the needlessness of having recourse to the eruption as a nomenclator for his "division of venereal complaints into four distinct diseases;" but, as if to put the question beyond dispute, he immediately proceeds to give the following brief description of the several ulcers and their consequent eruptions:—*First*, the ulcer without callosity, raised edges, or phagedena, in fact without any very peculiar characters, and which may therefore be termed the *simple venereal primary ulcer*, produces the *papular* eruption, which *ends* in desquamation; and the same effect is produced by a patchy excoriation of the *glans* and *prepuce* in men, and of the *labia* and *vagina* in women, and also by a *gonorrhœa virulenta*. *Second*, the ulcer with raised edges produces the *pustules* which terminate in small ulcers covered with *thin* crusts, and which *heal from their margins*. *Third*, the phagedenic and sloughing ulcers produce the spots and tubercles which terminate in ulcers covered with *thick* crusts, which are accompanied with *phagedena*, and *heal in general from their centre*. *Fourth* and lastly, the primary callous ulcer or chancre is attended with the well known *scaly eruption—lepra* or *psoriasis*." (pp. 68, 9). CARMICHAEL thus shows the grounds on which he had founded his opinion, that "the difference which was found to exist in the appearance and progress of certain groups of symptoms which usually went together, compelled him to presume the existence of a plurality of venereal poisons." (p. 48). But subsequently he observes:—"If any individual object to the division of venereal complaints into four distinct diseases, the difference between us is easily reconciled. Instead of four distinct diseases, let any one that pleases consider them as so many forms or modifications of the one disease, each requiring a peculiar mode of management, and under this view every practical object will be equally well obtained." (p. 69).

The following excellent observations of RICORD, whilst explaining the causes on which the varied appearances of chancre or primary syphilitic sore depend, at the same time negatives the much-disputed question of the plurality of venereal poisons, of which CARMICHAEL is the great supporter.

"Chancre," says RICORD, "the strict and inevitable consequence of the application of the syphilitic poison, either upon the skin or mucous membranes, in the condition requisite for inoculation, often presents such varieties, in its material aspect that it then seems to constitute different diseases. These differences of chancre, badly understood or ill-appreciated, have afforded to some an argument against the identity of the venereal poison and its unity of action, and to others, the proof of the existence of a plurality of poison; but, if well studied in its cause, which always remains the same in its mode of development, and its consequences, in the ordinary and not complicated cases, the seeming differences are explained with ease, and all contradictions disappear; for whatever be the actual form of the chancre from whence the pus has been taken, provided it have reached that period which I have pointed

out, a regular and characteristic pustule is, as I have said and proved, obtained, when the virulent pus is put beneath the epidermis or epithelium, a direct ulcer (*ulcère d'emblée*), when it is applied on naked tissues, or an abscess, when it is introduced into the cellular tissue, into a lymphatic or into a ganglion, always bearing in mind the difference arising from the seat and particular tissues affected, there is found in the ulcer, at its commencement, a regular and peculiar physiognomy, and that also whether it be consequence of the rupture of a pustule, of the opening of a virulent abscess of the cellular tissue or lymphatic passages, or whether it have been produced direct. The deviations or special forms neither occur nor are developed, but after and under the influence of condition foreign to the specific cause, such as the peculiar constitution of the patient, his previous or concomitant ailments, his health, the general or local treatment to which he has been subjected. Thus is it that persons are affected with phagedenic chancres, who have contracted their malady from persons who, seemingly, had only benignant ulcers, and that this vulgar notion, participated in by some physicians, who conceive that a severe disease had been contracted from a very foul person, is found absolutely false." (pp. 60, 61; Fr. Edit. p. 134–36.)]

Ingenious as are these distinctions, yet are they by no means confirmed by experience; besides the circumstances already mentioned, on which the modifications of syphilis depend, there is still especially the proved fact against the admission of various syphilitic contagions, that frequently many persons are infected in different ways by one and the same person. But the principal ground of this (Abernethy's division) that the syphilitic affection if cured only with mercury, but the pseudo-syphilitic without it, has, on the contrary, lost all weight, inasmuch as it is perfectly well known that all syphilitic ulcers may be healed without mercury.

If it may also to this be added, that as the result of congress of the sexes, affections may occur on the generative organs, wherein, by examination, no perceptible disease of the generative organs is observed in the person from whom the disease arises; that, farther, as consequences of constitutional ailments, ulcers and other affections may appear which resemble syphilis, so this does not disprove the above stated opinions, and we must herewith not forget how frequently the patient purposely deceives the medical attendant, and that especially all the circumstances which come into play in contagion are still not sufficiently clear, as the existence of primary bubo, without previous affection of the generative organs, which, however, cannot be denied, proves the explanation of syphilis from simple irritation without contagion (*a*) is a mere crazy systematic fancy (*b*).

826. The same differences observed in primary are noticed also in secondary syphilis. Experience indeed seems to show that after venereal *gonorrhœa* and after superficial exfoliation a vesicular eruption, inflammation and wound of the throat, and inflammation of the synovial membranes, take place. After primary ulcers with everted edges without hardness, a pustular eruption, whitish ulcers on different parts of the palate, pains in the joints and gummatous swellings; afterwards eating and scurfy ulcers, tubercular growths on the skin, pustules, ulcers in the throat extending to the nose and destroying its bones, pains in the joints and *tophi*. After ulcers with lardaceous bottom and everted, hard, callous edges, a vesicular eruption which scales, deep, hollow ulcers in the tonsils, pains in and swellings of the bones. These relations between the primary and consecutive affections are not throughout constant; often is one kind of primary affection followed in the same patient by an erup-

(*a*) Richond; in Froreip's Annalen, vol. viii. No. 17.

(*b*) Evans, Pathological and practical Remarks on Ulceration of the Genital Organs. London, 1819. 8vo.

Guthrie, Observations on the Treatment of Syphilis without Mercury; in Med. Chir. Trans. vol. viii.

Wedemeyer, Bermerkungen über die Syphilis und ihrer verschiedenen Formen und über die Wirkungen und den Gebrauch des Quecksilbers in Derselben; in Rust's Magazin, vol. ix. p. 195.

tion of entirely different kind, which may occur either at the same time on different parts of the body or may break out one after the other.

On these grounds I consider the admission of a *gonorrhœal contagion*, as proposed by RITTER (*a*), to be untenable.

827. In the *prognosis* of syphilis the following circumstances are to be observed:—

Primary ulcers are more easily healed than secondary. The connexion of syphilis with other dyscrasies renders the cure difficult and may even make it impossible. The more recent is the disease, the more favourable is the *prognosis*. Syphilitic affections of the bones are more difficult to be subdued than those of the skin: those of the nose-bones are liable to more frequent relapses than those of the tubular bones. In warm climates and in summer the cure is more easy than in cold climates and in winter. Pregnant women in an advanced state of syphilis miscarry or bring forth a weak, ailing child. The ulcers in the throat and in the nose often easily produce extremely disfiguring destruction. All syphilitic growths are obstinate and easily recur. If, after the cure of primary syphilitic ulcers, hard scabs (*Tubercula callosa*) remain, a relapse is always feared.

[So does not think JOHN HUNTER, for he observes:—"The *gonorrhœa* in its cure is the most uncertain of the three (forms of disease,) the chancre next, and the *lues venerea* the most certain, although cured by the same medicine which cures the chancre. * * * A chancre may sometimes be cured in two weeks, and often requires as many months, which is in the proportion of four to one. The *lues venerea* in general may be cured in one or two months, which is only two to one." (p. 353.)

"In the cure of chancres I have sometimes seen," he says further, "when the original chancre has been doing well, and probably nearly cured, that new ones have broken out upon the prepuce, near to the first, and have put on all the appearance of a chancre; but such I have always treated as not venereal. They may be similar to some consequences of chancre which will be taken notice of hereafter." (p. 259.)

"Chancres," ABERNETHY observes, "do sometimes heal spontaneously, generally, however, though not constantly, leaving a thickening or induration of the part affected. They may also be induced to heal by topical means, without mercury, with similar events. Some enlargements of glands in the groin will also, in like manner, subside. It may be fairly supposed that if some chancres heal spontaneously, constitutional diseases, arising from the same cause, may, in like manner, sometimes get well without mercury. The question can only be solved by experience. Delay will, I am sure, frequently enable a surgeon to decide that the disease is not syphilis; but there are cases in which no amendment takes place, and the surgeon is, as it were, forced, from the progress of the disease, to employ mercury, though doubtful of its nature." (pp. 48, 9.)

"It often happens," says JOHN HUNTER, "that after chancres are healed and all the virus is gone, the cicatrices ulcerate again and break out in the form of chancres. Although this is most common in the seat of the former chancres, yet it is not always confined to them, for sores often break out in other parts of the prepuce; but still they appear to be a consequence of a venereal complaint having been there, as they seldom attack those who never had *gonorrhœa* or chancres. They often have so much the appearance of chancres that I am persuaded many are treated as venereal that are really not such; they differ from a chancre in general by not spreading so fast nor so far: they are not so painful nor so much inflamed, and have not those hard bases that the venereal sores have nor do they produce buboes; yet a malignant kind of them, when they attack a bad constitution, may be taken for a mild kind of chancre, or a chancre in a good constitution. I have seen several that have puzzled me extremely. Some stress is to be laid upon the account that the patient gives of himself; but when there is any doubt, a little time will clear it up. I have seen the

(*a*) Above cited.

same appearances after a *gonorrhœa*, but that more rarely happens. It would appear that the venereal poison could leave a disposition for ulceration of a different kind from what is peculiar to itself. I knew one case where they broke out regularly every two months, exactly to a day." (p. 265.)]

828. The opinions as to the treatment of syphilis are very much divided and may be arranged in two classes:—

1. *The treatment with mercury.*
2. *The treatment without mercury.*

1.—OF THE TREATMENT OF SYPHILIS WITH MERCURY.

829. In the cure of the primary syphilitic ulcer the most especial indication is to prevent the general venereal disease; it is therefore advisable to connect a general treatment to that effect with a suitable local treatment.

830. The *local treatment* has for its object the destruction of the syphilitic poison in the ulcer, the cleansing of its surface, and by a continued use of proper remedies to effect a cure. This is aimed at by touching the ulcers with nitrate of silver or caustic potash, most effectually with a saturated solution of mercury in nitric acid, or with a strong solution of sublimate. The ulcer should be frequently washed during the day with a weak solution of sublimate, or with phagedenic water and charpie moistened in either of these fluids applied over the ulcer; or it should be bound up with red or white precipitate, with citron ointment, and so on, and carefully kept clean. This treatment must always be guided by the degree of inflammation; in severe inflammation and great pain soothing remedies must be applied.

The destruction of the ulcer with nitrate of silver which has of late found in Ricord a zealous advocate, is only of use when the disease is still merely local, a period of time which is extremely short and difficult to determine.

831. At the same time should be given internally the milder preparations of mercury, the *mercurius solubilis* of Hahnemann, or calomel, at a quarter or half a grain, and in increasing doses according to circumstances. The patient during this mercurial cure must keep himself as quiet as possible and in an equal temperature, must live moderately, take neither heating nor acid food nor drink, and further perspiration by a decoction of woods.

["I should state decidedly" says Lawrence, "as the result of my own experience that there are very few instances of secondary symptoms occurring where the primary sores of the descriptions I have already mentioned, were treated with mercury. It is my plan in private practice, to employ mercury moderately—not extensively, but moderately—in the treatment of primary syphilitic sores, (excepting in the cases of sloughing and phagedenic sores,) and certainly I have been in the habit of seeing secondary symptoms very seldom occurring in such cases. * * * I would state then that in the description of sores I have mentioned, I should generally administer mercury in a moderate way. In the first instance, one would clear out the alimentary canal of such patients; one would keep them as quiet as possible, put them on a moderate diet, and administer mercury moderately; three, four, or five grains of the blue pill two or three times a-day, and apply the black wash, calomel, and lime water, to the sores; and this kind of treatment is certainly, on the average, very successful in the cases of which I am now speaking. The employment of mercury is more particularly necessary in the cases of indurated chancre; and whether the chancre possesses that character originally, or whether the induration comes on subsequently, or whether the induration comes in a secondary way, after the primary sore is healed, and shows itself simply as induration without sore, I think

the employment of mercury is equally required. We cannot consider our patients safe so long as such induration remains, and I think it is desirable to use mercury in those cases, and to continue the employment of it until the induration has completely disappeared." (p. 770–71.)

With regard to the extent to which the use of mercury should be pushed, Lawrence proposes two very pertinent questions, to which he gives equally good replies,—*First*, whether a slight degree of action of mercury on the mouth may be considered a proof that it has produced all the effect necessary for the removal of the venereal disease; or, *secondly*, whether a more considerable effect is necessary generally, or in particular cases? It has been much the habit, in modern times, to produce a sensible effect on the mouth, and then to discontinue the mercury, under a notion that when the mouth is affected at all, the system has experienced a sufficient influence for the removal of the disease. I cannot coincide with this opinion. In a great number of instances a slight effect of mercury on the mouth is sufficient; but there are instances in which that slight effect does not remove the symptoms, and which, when the remedy is carried further, so as to produce more considerable influence, the symptoms give way. In fact, I think we never see the symptoms of syphilis yield so rapidly, and so favourably, as in certain cases, where the remedy, perhaps, without our wishing it, has produced a pretty profuse salivation. Under these circumstances we may notice a sudden and rapid amelioration of the symptoms, which we are not in the habit of seeing when the mouth is affected in a slighter degree only. Another question immediately connected with the same point is, how long the remedy should be continued? Is it sufficient to destroy the venereal character of a sore and to produce the healthy process of restoration? Would you leave it off then and leave the cicatrization to form of itself? May you discontinue the use of the mercury the moment the cicatrization is complete, or should you try to secure the patient from the occurrence of secondary symptoms, by proceeding with the employment of the remedy after that? These are important questions, and we have not, perhaps, the means of answering them satisfactorily. With respect to the first, however, it is certainly not safe to discontinue the use of the mercury before the sore is cicatrized all over. Then, secondly, is any good produced by continuing the use of the mercury after the cicatrization is complete, with a view of preventing a return of the symptoms? This is a very important question, and if you refer to the best writers on the subject you will find but little to assist you. * * * General experience, however, has led to a belief that perseverance in the use of mercury for some time, say about ten days or a fortnight after cicatrization, has a beneficial effect in protecting the constitution; so that persons when they have used mercury to the extent I had mentioned, are not in the habit of suddenly discontinuing it, but of carrying it on for a short time after the apparent removal of the disease, under belief that its continuance tends to prevent the recurrence of further evil." (p. 732.)

"There are many in the present day," observes Green (*a*), "who seems to have a great aversion to mercury, and certainly if our opinion is to be formed from the practice which was adopted by some, within my recollection, and even to a degree within these hospitals, there is no doubt very sufficient ground for not following the practice of our predecessors. But it would be evidently most injudicious to reject the aid of mercury in the cure of the venereal disease on the ground of the ill effects that may result from its mismanagement, or have been produced by its abuse. We now see the error of the old surgeons, and do not think it necessary that patients should spit saliva by the pint, nor do we see them in what were fitly enough, from their stench and ill ventilation, called the 'foul wards' of the hospital, with their tongues ulcerated, swollen, and protruded, their faces tumified, and under all the miseries attendant upon a thorough salivation. We give mercury now in moderate quantities, and it is, I believe, from this improved method of treatment that we now see comparatively few cases of horrible mutilations from sloughing of the *penis*, from losses of the palate and nose, and from extensive and destructive disease of the bones. Mercury may no doubt be regarded as a specific in the cure of the venereal disease. What this peculiar action of mercury consists in it is impossible to say, and it is equally obscure with the effects of other specific remedies; but we judge of its operation from its sensible effects, and experience guides us in determining the

(*a*) Unpublished Clinical Lectures on the Treatment of Syphilis.

quantity of the remedy which may be necessary, and the degree of effect which may be requisite for the cure of the disease; mercury, in short, requires the same caution and judgment in its administration as any other remedy. And although, as I said before, a much milder course than was formerly exhibited may be sufficient to cure the disease, yet it will be necessary to adopt it in particular cases, and to vary the mode of using it in different stages of the complaint, or you may have some of the ill effects which were formerly observed, and the patient's health may be destroyed without curing the disease. The advantage and benefit of mercury are not then derived from the quantity introduced or from the violence of its effects, but from keeping up a regular and continued action for a certain period. In general the action of mercury should be kept up three weeks for a chancre, a month where the primary sore has been succeeded by bubo, and from six weeks to two months in cases of secondary symptoms; and if the symptoms should disappear quickly, still it will be right that the remedy should be continued, for the mercury is not given to cure the local symptoms only, but to ensure the system against their recurrence, and to destroy the disposition to disease in those parts which have been contaminated by the poison.

"Something may be said too with respect to the form of giving mercury. Where you wish to continue it for a length of time you should give the mild form; where you wish to effect the system quickly, those kinds should be exhibited which are calculated to operate more rapidly. Hence it is not an unimportant matter whether we should give calomel, blue pill, *hydrarg. c. cretâ* or the oxy-muriate of mercury. What we ordinarily employ in private practice is the blue pill; but in the hospital we commonly use mercurial friction. Mercurial friction can be very thoroughly effected in the hospital; but in private practice it is seldom effectually accomplished, as it is troublesome, dirty, and leads to the exposure of the complaint, and, therefore, except in peculiar irritability of the bowels, is seldom adopted. Five or ten grains of blue pill twice a-day with the addition of opium if the bowels should be irritable, will very commonly be sufficient to cure any complaint similar to that which we have been considering, in short, any secondary form of the disease; but then it must be a sustained course of mercury, its influence must be kept up on the system for six weeks or two months, or even for a longer period when the bones have been effected. It is necessary not so much to be guided by time as by the disappearance of the symptoms; and it is right to continue the effect of the mercury somewhat longer, a week, ten days, or a fortnight after the symptoms have subsided.

"But you will ask me what proof you are to have of the system being sufficiently influenced by the mercury, and how you are to know that its action is kept up without prejudice to the patient? During the mercurial treatment we ought to be satisfied that it has a due effect, and we commonly look for this in the affection of the gums, which become spongy, swollen, red and tender. An increased flow of saliva is the usual accompaniment of this state of the gums, and the term, ptyalism is often used as an equivalent term for the requisite influence of the mercury on the system; but the increase of the saliva is not at all a necessary consequence of the affection of the system, and is no proof in itself of the efficacy of the remedy; indeed, in some persons it does not take place at all, although there is abundant proof of mercurial action. In fact, the operation of mercury is that of producing a febrile action in some respects similar to hectic, that is, there is increased action of the heart and arteries, with an augmentation of the secretions; and we shall find, in a person who is the subject of mercurial action, that the pulse is quickened, that the secretions are increased, and the predominant increase may be in the saliva, in the urine, in the perspiration, or in the secretions from the bowels, that the muscular strength is diminished, and that the body wastes. We may be therefore satisfied if any of these effects are produced, and we must be careful not to push the operation too far."

832. If the ulcer be obstinate, or the condition of the patient render the observation of the dietetic treatment already mentioned impossible, then sublimate must be used, beginning with the eighth of a grain daily and gradually ascending. In chancres which spread unusually quickly even during the internal and external use of the sublimate, in which the edges of the ulcer are extremely hard, and their surface has

a carcinomatous appearance, the quieting and cleansing of the ulcer is effected merely by the external use of the red precipitate, and smart touching of the whole surface of the sore with lunar caustic. This local treatment is, however, hurtful if there be general irritation present, under which circumstances only a soothing treatment to diminish the irritation should be employed.

The recommendation that in the treatment of primary syphilitic affections nothing should be applied locally, so that the changes of the sore may indicate more certainly the corresponding destruction of the disease by the mercury employed only internally, is objectionable, because by local treatment the sore is often easily brought to a simple state, and the longer the ulcer exists, the more is the general infection to be feared from absorption of the poison.

Delpech (*a*) considers that in primary syphilitic affections, mercury in the way of friction of *ung. hydr. cin.* may be most efficiently employed in the neighbourhood of the infected part for the prevention of general infection.

[When a chancre takes on a sloughing character, as described by Lawrence, it must not on any account be treated with mercury in any form, either internally or externally, for its employment will only aggravate the mischief, render the sore still more irritable and active, and hasten and extend the spread of the sloughing process. When therefore a chancre begins to slough under the use of mercury, that must be immediately suspended. The local treatment of brushing over the whole surface with strong nitric acid as recommended by Welbank (*b*), once or twice, is the best that can be adopted. In the course of a few hours, generally, the pain subsides, the sloughing process is arrested, the angry red edges around the slough begin to grow pale, suppuration is set up, and the line of demarcation between the living and dead parts appears, and gradually deepening, the slough is completely defined, and slowly separates from the healthy parts beneath. After the application of the acid, a stimulating poultice of yeast, stale beer, or treacle, should be applied, either directly to the surface of the sloughing sore, or lint dipped in nitric acid wash, or in solution of chloride of soda, may be interposed. As in these cases there is always great restlessness as well as depression of the constitutional powers, opium, either as laudanum, or as the salts of morphia, must be given in sufficient quantity to produce quiet and sleep. The patient's strength must be supported by the most nourishing diet, and brandy, or gin, or porter, or both, in sufficient quantity, must be given; two, four, or six ounces of the former, with one or two pints of the latter daily, are almost always requisite, as these frightful cases usually occur in persons, especially women, who are accustomed to live almost entirely on spirits and can take little food. Some recommend the application of leeches upon the inflamed circumference of the sore, but they should never be used as they only assist in diminishing the patient's powers, already too much depressed.

The recovery from this complaint, after the separation of the slough, is very slow, and the discharge very profuse; good diet, with the spirits, or porter, in diminishing quantity, is therefore, to be continued; and the wound may be treated, either simply with nitric acid wash and poultice, with the latter alone, or with some mild greasy application, to which the medical attendant will be guided, by observing what best agrees with the sore, and which will not be the same with all patients.

It is a very interesting fact, that secondary symptoms, after sloughing chancre, are extremely rare, the disease seeming to exhaust itself by the virulency with which it has seized on the part attached. Therefore, mercury ought not on any account to be exhibited as a preventive against symptoms which probably will never occur.—J. F. S.]

833. If the ulcer heal with this local and general treatment, the internal use of the mercury must not at once be given up, but should be continued in smaller doses for some time.

834. The *treatment* of Buboes is to be guided according to the degree of their inflammation. If they be painful, the patient must be kept quiet, cold poultices of bread crumbs with lead wash, linen dipped in

(*a*) Above cited. (*b*) In Med.-Chir. Trans. vol. xiii.

lead wash applied, and leeches, or even bleeding employed if the patient be strong and inflammatory affection of the whole body be present. In the more cold swellings gray mercurial ointment is to be rubbed in, and mercurial and hemlock plaster applied over it. In hard swellings softening poultices are especially serviceable.

Idiopathic buboes have a decided disposition to suppurate; when, therefore, the dispersion of a bubo does not easily and soon follow, it must not be urged by violent remedies, but suppuration must be promoted by softening poultices, by mercurial and hemlock plasters; and this treatment must be continued till the bubo have opened itself (1). These remedies serve also, after the opening of the bubo, to resolve the surrounding hardness. The still remaining ulcer must be treated as a venereal sore. To prevent burrowing of the pus, enlargement of the opening is frequently necessary. The violent dispersion of an idiopathic bubo may accelerate the outbreak of the general venereal disease. If the bubo run on to hardening, then besides the proper mercurial cure must be employed friction of gray mercurial ointment with camphor, hemlock and mercurial plaster, or friction of iodine ointment.

According to my experience, I assent to the opening of buboes in the same manner as abscesses, by a simple puncture, by a transverse cut, by the introduction of seton threads or by caustic, as advised by many persons (*a*).

The compression of buboes recommended by Ferguson is especially employed by Fricke in connexion with strict antiphlogistic treatment. Any hard properly-shaped body, for instance, according to Fricke, a piece of wood or a stone sown up in linen will answer the purpose (2). For the dispersion of buboes without distinction of their nature and duration, Reynaud, Ricord, and others have recommended the application of blisters of the size of a shilling or half-crown upon the middle of the swelling, and after the removal of the cuticle raised by the blister to touch the part with a feather moistened in a solution of sublimate, twenty grains to an ounce: if, after two hours, no slough has been produced, the touching is to be renewed and a bread poultice applied (3). The suppurating parts heal in a few days, and by continued use of the poultice, the bubo either entirely subsides, or it diminishes and disappears at the second or third application.

[(1) A bubo should always be punctured, as soon as fluctuation can be felt near the surface, with a moderately large opening; about half an inch in length is generally, I think, sufficient, but some surgeons prefer slitting it up from end to end, and believe it heals more readily, I think, however, the less large aperture is sufficient. Occasionally, it happens, whatever be the size of the opening, that the pus will burrow and sinuses will form. If not irritable these may often be cured by gentle and well-applied pressure from the extremities of the sinuses towards the wound, care being taken to leave the latter free for the discharge of the pus. This, however, will not always be effectual, and it then becomes necessary to lay the cavities freely open and keep them so by inserting lint between their edges; and this may be either dipped in black wash or nitric acid wash, or smeared with red precipitate ointment. Oftentimes the ulceration continues eating beneath the skin of the edges of an indolent open bubo; which thus undermined, has a bluish appearance, with a white irregular and insensible edge, and has not sufficient power to take on the adhesive action and unite with the parts beneath. It must then be removed, which is sometimes done by shaving off with the knife. I think, however, destroying it with strong nitric acid is best, as it produces a healthy excitement, and the skin usually soon shoots over the sore surface. The quantity of undermined skin will show the medical attendant how much should be destroyed at a time; if there be little, one application of the acid is sufficient; but if much, it will be advisable to destroy portions successively till the whole is got rid of. If a bubo takes to sloughing, as it will do occasionally, it must be soothed, or even treated with nitric acid as directed for sloughing chancre. I have known it destroy life by ulcerating the femoral

(*a*) Fricke, chirurgische Annalen des Hamb. Krankenhauses, vol. i.

artery and producing fatal bleeding. I doubt not much benefit would be derived by taking up the artery above the sore.

(2) I am not in the habit of using pressure for dispersing buboes, but I have seen it occasionally beneficial.

(3) Of the employment of sublimate after blistering to produce a slough I have no experience, but think it must be rather sharp practice. The application of blisters alone to indolent buboes is often very advantageous; sometimes they excite the absorbents, and the swelling is removed; at other times they excite increased vascular action, and the bubo suppurates, and after opening, or having been opened, gets well: so that in either case the blister does good service. I have occasionally removed the skin from the blistered surface and dressed it with iodide of potash ointment, or with mercurial ointment, and with beneficial result.—J. F. S.]

835. The treatment of the general venereal disease requires a more powerful use of mercury than in primary syphilitic affections. Mercury is employed *internally* or *externally*.

836. The external use of mercury is to be recommended only in those cases where the patient cannot bear it even in connexion with opium, mucilaginous remedies and so on, in consequence of habitual purging; in some persons also especially on account of pains in the bones. This mode of treatment, however, usually excites little salivation, and by many persons cannot be borne on account of the peculiar sensibility of the skin. From half a drachm to a drachm and still more of the gray mercurial ointment is to be rubbed on different parts of the body daily or at longer intervals. Sublimate baths have also been recommended, and the rubbing in of half a drachm of sublimate with as much muriate of ammonia every evening upon the soles of the feet, (after they have been softened by some days' previous warm foot-baths), together with the simultaneous use of a luke-warm bath every other day, of decoction of sarsaparilla (*a*), as also the rubbing in of red precipitate, dry or mixed with spittle, and many other modes of treatment (*b*). The last two modes of treatment are, however, much less efficient than rubbing in gray ointment.

837. In the ordinary and not very old cases of venereal disease, the internal use of mercury is preferable to the external. The *mercurius solubilis* of HAHNEMANN, or calomel, are given; or because these preparations easily excite salivation, which prevents their continuance, sublimate is especially used. Under this treatment the patient must closely follow the dietetic rules already laid down, and according to the different degrees of irritation they must alternate with the preparations of mercury.

838. Besides this general treatment, certain appearances of *Lues* require especial attention.

In syphilitic ulceration of the throat and palate the pencilling recommended by RUST (*c*) is especially useful, and to be applied once or twice a-day to the surface of the ulcer by means of a pencil of charpie (1).

(*a*) CIRILLO, Praktische Bemerkungen über die venerischen Krankheiten, translated from the Italian by DAHNE, Leipzig, 1790. There is also a French translation by AUBERT. Paris, 1803.

I am sorry I have not been able to see either the original or the translations of this work, for I cannot imagine the possibility of half a drachm of sublimate being recommended to be rubbed in nightly.—J. F. S.

HUFELAND, Journal der praktischen Heilkunst. 1819, March.

(*b*) ANSIAUX, Clinique chirurgicale.

(*c*) ℞ Merc. subl. corros. gr. vj.—xii.
Extract. cicutæ,
——— flor. chamom. āā ʒij.
Tinct. anodyn. simp. ʒj.
Mell. rosar. ʒj.

In syphilitic eruptions washes of sublimate water, of *aqua phagadenica*, sublimate baths, various kinds of mercurial ointments, and drinks operating on the skin, are employed (2).

If the granulations do not diminish under the general mercurial treatment, they must be washed with a strong solution of sublimate, strewed with savine powder touched with caustics, especially with *liq. hydr. nitr.*, or removed with the knife or scissors, and the places where they were, touched with caustic. Even when the general *Lues* has been long cured they are often extremely obstinate.

Syphilitic diseases of the bones require a commensurate mercurial cure, according to some, especially *Mercurius nitrosus* and wood drinks. In nodes and gummatous swelling, hemlock poultices and rubbing in mercurial ointment with opium are used. In most cases, these swellings, which depend on exudation beneath the *periosteum* become softer, less painful, and gradually diminish, and a slight depression and irregularity remains in their place. In *tophus*, irritating remedies, as mercurial and hemlock plasters with ammoniacum or blisters are to be used; and the same applies to *exostosis*. But if these swellings be accompanied with inflammation leeches are to be applied and mercurial ointment rubbed in. In pains in the bones the combination of mercury with opium internally and externally is fitting, and the use of wood drinks (3).

[(1) Mercurial fumigation of the throat in syphilitic ulceration of the tonsils and *pharynx* is a very efficient mode of treatment, as the mercurial fumes get at all those parts of the sores which cannot be reached by pencilling. Nitric acid, or chloride of soda gargle, are also very useful applications.

(2) When secondary syphilitic sores have formed, which, as Lawrence has observed, are sometimes the result of pustules, and which pustules, it might have been added, often commence in vesicles, the scabs generally assume a conical form, and sometimes attain great height by circular rings being continually produced at their base, corresponding with the enlargement of the sores, resulting from the confined matter producing ulceration by its pressure; and, as at this part the scab is softest, it bulges around the sore, and thus ring below ring of scab, each of greater circumference than the other, is produced, and thus a graduated or step-like conical scab is formed which has close resemblance to the scab of a rupial sore. If this scab be rubbed off, the edges of the wound are very painful and irritate, and soon set about forming another, but imperfect scab, which worries the patient exceedingly. So long as such scabs remain on the sores, so long do they continue increasing and the sores spreading; and as they are thick and hard, no application to them is of the least service. They should therefore always be removed by poulticing, after which, by the application of red precipitate ointment, together with constitutional treatment, they generally heal kindly. The same internal remedies for such eruption will not always be found suited to different cases. Sometimes the use of generous and strengthening diet, with porter or wine, is sufficient, as such patients are usually much out of health and worn down by the suppuration. It is, therefore, advisable always to commence with this mode of practice, with the risk of a reappearance of secondary symptoms, which is not unfrequent. But sometimes this treatment is utterly useless, and it is requisite to use mercury to affect the constitution: this must, however, be done with the greatest caution, and with constant watching. If the sores improve and the patient's appearance betters, and he begin to get flesh, it is a proof that this is the proper treatment; if, on the contrary, the sores become more irritable and spread, and there be increased general disturbance, the mercury must be left off, and the general irritation quieted if possible by merely soothing treatment with sarsaparilla or gentle tonics and sedatives—either opium or *hyoscyamus*. But it may be still necessary to resume the mercury, and sometimes, though the constitution will not bear it at its first or second use, it will at last seem

to yield to the necessity of its employment will first bear with it without seeming benefit, then gradually become accustomed to it, and at last improve under it, and be freed from the disease. I have seen this result again and again, and I am convinced of the occasional absolute necessity for the employment of mercury in this form of syphilitic eruption, although it may at first seem to be impossible to persist in its use. The other forms of syphilitic eruption are more quickly and effectually cured by the use of mercury, but they may also be cured by iodide of potash, which is a most valuable remedy for persons, who, as occasionally happens, cannot bear the use of mercury; which, however, I believe much less frequent than supposed, and that rather the failure is in want of proper attention on the part of the medical attendant in the use of the medicine, than in the action of the medicine itself. In the employment of iodide of potash in these eruptions it must not be expected that the disease is at once cured; for such is not the case. The eruption not unfrequently recurs two or three times, as if a contest were going on between it and the medicine, but it is at last worn out and appears no more. I must confess, however, that if the patient's constitutional appearance do not oppose it, I prefer treating these eruptions with mercury, as the cure is more speedy and most certain.

[(3) The best and most certain treatment for nodes is that by mercury which must be continued for six or seven weeks; and under its use these swellings, whether from fluid or from the actual diseased growth of the bones, slowly but steadily subsides, so soon as the constitution becomes affected. The same effect takes place even more rapidly by the use of iodide of potash, which may be taken internally in doses of from three to five grains, with a drachm of syrup of poppies, and in either decoction of sarsaparilla, or compound infusion of gentian with some warm tincture. The quick absorption under this treatment is often very surprising, but the cure is not permanent, and the nodes reappearing again and again, call for the repetition of the medicine till the disposition to their production is overcome, just as in the eruptions already mentioned. It is rarely necessary in these cases to cut down through the skin and *periosteum*, as was formerly almost always practised when there was much fluctuation; and its absorption may be hastened by blistering, and either dressing the sore with simple ointment or with iodide of potash ointment. But when fluctuation is accompanied with much pain and tenderness, and with redness of the skin, and the swelling increases instead of diminishing, then it may be expected that suppuration has taken place, and it is best to make a free incision for the escape of the matter. If this be not done, the pus gradually separates the *periosteum* more extensively from the bone, and there is great danger of it being destroyed. This death of bone from syphilitic suppuration beneath the *periosteum*, is more common on the skull, than elsewhere and more serious, as not unfrequently both tables of the bone are destroyed. It rarely however happens except in persons of irritable habit and broken up constitution. Such fluctuating nodes should therefore be emptied by incision, if they do not early yield to the local and constitutional treatment.—J. F. S.]

839. I have endeavoured to point out the various preparations of mercury according to their special and ascertained operation on the several conditions of the disease; it must, however, be premised on this point, that there are indefinable peculiarities in certain constitutions. There must therefore be a variation of these preparations, when one preparation has at first produced improvement, but on long continuance and more powerful application no further benefit results; or if from one preparation even in an increased dose scarce any advantage is gained, in such cases the preparation selected is not suited to the constitution. In syphilitic ulcers with severe inflammatory symptoms, every employment of mercury is at the onset improper; baths, softening and purgative remedies are alone to be employed, and in strong persons bloodlettings.

Besides the mercurial preparations already mentioned, there have been of late brought into use *Hydrarg. phosphor.* to grain doses, (Starke), the iodide and bromide of mercury $\frac{1}{6}$th of a grain three times a-day, (von Graefe), and the *Hydr. cyanic.* to $\frac{1}{4}$d and $\frac{1}{16}$th of a grain dose (Mendaga, Parent).

840. The *Flow of Spittle* (*Salivation*) is not necessary for the cure of the venereal disease, and is rather to be avoided, as thereby the further use of the mercury is interfered with, and often no trifling destruction of the mouth and teeth produced. When, therefore, the precursors of salivation, as swelling of the gums, metallic taste, and offensive breath have set in, the dose of mercury must be diminished, the preparation changed, or it must be entirely given up. The patient must be kept warm, and when these symptoms have subsided, the mercury must be resumed. When salivation has commenced, many remedies are advised; as purgatives, sulphur, camphor, opium, blisters, and so on, but experience does not confirm their particular effect. The most suitable, however, are keeping warm, change of linen, warm bed, attention to keeping the bowels open, the use of astringent gargles for the mouth; internally, bark, acids, especially the phosphoric. It must not, however, be overlooked that in confirmed *Lues* it is necessary for its fundamental cure, that the mercury should be continued to incipient salivation, which should be kept up for several weeks, as frequently that alone proves the sufficient operation of the mercury upon the constitution.

841. In cases of very old venereal disease, in which often the modes of treatment prescribed are insufficient, several very active modes of cure have been proposed, among which may be especially reckoned, 1, the *Friction* and *Hunger Cure;* 2, the *Mercurial Cure*, after Weinhold's plan; and, 3, Zittmann's *Decoction.*

842. The *Friction-Cure* long since (*a*) highly esteemed, has recently been brought into great repute by Louvrier (*b*) and Rust (*c*). The latter has also extended its employment to diseases not syphilitic, of which, however, a complete destruction is the foundation of the reproductive processes. The mercury does not in this treatment, operate as a specific against scrofulous, gouty, syphilitic and other diseases, but simply as exciting the activity of the lymphatic system, by which the absorption may go on to completion, the previous degeneracy return to the natural condition, the entirely useless deposits be got rid of, and so a perfect consent of the organism produced.

843. This cure is indicated in syphilitic disease where disordered digestive organs forbid the internal use of mercury; when from the mercury a too little or too great affection of the bowels or of the whole system occurs; when the *syphilis*, having become a general affection, attacks the bones and tendons; when *caries*, exudation into the joints, hardening or disorganization of the different tissues are present; and when a *syphilis* will not yield to the internal use of mercury: in diseases not syphilitic, in which from mere gouty, scrofulous, or rickety causes, swellings in the skin, glands, and bones, growth or other diseased affections are produced as the result of an anomalous vegetation, and cannot be removed by other means, for instance, swellings of the joints, dropsy of the joints, *spina ventosa*, and wide-spreading ulcers: also in herpetic, leproid eruptions, hardening of the testicles, of the breasts, and so on. Even in those cases where diseases arise from simply local causes, hardening and

(*a*) Faber, above cited.
(*b*) Above cited.
(*c*) Ueber die Heilkraft der methodischen Quecksilbereinreibungen in syphilitischen und nicht syphilitischen Krankheiten; in his Magazin für die gesammte Heilkunde, vol. i. p. 354.

degeneration of the cellular tissue, callous changes, carious destructions, fistulous ulcers and the like, which on account of their unnatural condition and situation often for years withstand every kind of treatment, even the repeated application of the knife, or even render the latter impossible.

844. The friction cure is always a very severe mode of treatment, and for the patient accompanied with much trouble (1). It must therefore not be employed on those patients who are very weakly, who have very irritable nerves, in hysterical, hypochondriacal patients, in those who are much disposed to agitation or are affected with other diseases, as complaints of the chest, coughing up of blood, hectic fever, dropsy, scurvy, and the like. When, however, these diseases are the consequence of *syphilis*, the friction-cure is indicated. The skin of many persons has also a too great or too little receptivity for mercury, which at first cannot be determined. In the former case generally the cure is not completed ; in the second no cure ensues.

[(1) I cannot at all agree with Chelius's opinion on this point; for, beyond all doubt, the employment of mercury by friction is the mildest mode in which it can be used, and the only way in which it should be used, if imperatively called for, in the very cases where Chelius forbids it. One very important point must not, however, be lost sight of, to wit, the support of the constitution by generous diet, with porter or wine.—J. F. S.]

845. The cure itself primarily consists in the proper preparation of the patient by bathing, purging, and a strict diet, by which the susceptibility for the operation of the mercury is increased and the absorbing process promoted, so that even a smaller quantity of mercury may produce the alteration of the constitution. The patient should first take a purge, then every other day a bath not warmer than 29° R. [= about 97° Fahr.] Without any contrary indication twelve baths should be taken, but where the destruction of an important part is to be feared, then less may be used. In robust full-blooded persons the effect of the cure is always rendered more powerful by one or two blood-lettings. Phlegmatic puffy persons often derive no benefit from bathing, and therefore must not bathe beyond three days. During the use of the bath, and subsequently during the rubbing in, the patient should take thrice a-day a lightly boiled porridge of a pint of meat broth with some grits, barley, rice ; or instead of the porridge a cup of coffee on the first day, also some boiled ripe fruit or pears ; and for drink a decoction of *rad. bardanæ*, *liquiritiæ* and *altheæ*, not exceeding three pints in the twenty-four hours. But frequently it is necessary with old weakly persons to give more strengthening diet, wine, meat broth, with eggs and the like. In women the preparatory treatment must be complete before the commencement of the menses ; and when they are over, then the rubbing in may be begun. If the menses recur at every fourteen days, the treatment must be so arranged, that they should have ceased before the critical days, and not interfere either with the medical treatment or with the evening frictions. If it should come on unexpectedly during the cure, the friction must be put aside. After the bathing is finished a second purge is to be ordered, and then the rubbing-in proceeded with.

[Of all the preparations here recommended English surgeons take no heed, excepting the clearance of the bowels at the onset, and a light unstimulating diet during

the treatment. Nor is there any necessity to suspend the rubbing, in women during their monthly courses.—J. F. S.]

846. Twelve rubbings are nearly always sufficient to cure the inveterate venereal disease ; frequently from five to six, most commonly nine ; mostly no syphilitic disease requires more. Nothing definite can, however, here be fixed ; the number of rubbings must depend on circumstances. For rubbing in, at first, one drachm, and afterwards one and a-half or two drachms of well-prepared gray mercurial ointment is to be used. The hand with which the rubbing is to be done should be previously warmed before the fire, and the rubbing should be continued five minutes.

According to Wedemeyer (*a*), in old and stubborn cases from eighteen to twenty rubbings of a drachm and a-half each are necessary ; in very old and very stubborn cases, especially if the salivation be backward and sparing, from twenty-four to thirty rubbings of a drachm and a-half each, but seldom more are required. On the contrary, Rust (*b*) thinks he has never found this necessary ; but when it was practicable, he increased the quantity of the ointment to be rubbed in commonly to two, two and a-half, and even to three drachms, which agrees with my own experience.

[Our common hospital practice is to rub in a drachm of mercurial ointment every other night till the gums begin to swell, become spongy and sore, and the flow of spittle be increased ; which effected, the rubbing is continued either as frequently or less frequently according as the soreness of the gums and the salivation continue the same or increase. The state of the gums and the flow of spittle are not, however, always indicative of the effect of the mercurial rubbing on the constitution ; often is there neither soreness of gums nor salivation, but other excretions are increased, as the perspiration, or urine, or both, or there may be neither even of these, but the constitutional affection is shown by the wasting of the body and of the strength. The best guide, however, is the condition of the sore, which improves as the rubbing lays hold on the constitution.—J. F. S.]

847. The following is the order in which the rubbings-in are to be conducted :

On the first day, in the morning, the patient rubs in the prescribed quantity divided on the two legs, on the third day on the thighs, on the sixth day on the two arms, from the wrists to the shoulders, on the eighth or ninth day on the back, from the hips to the neck. From the seventh to the fifteenth day, according to circumstances, two, three, or four rubbings on these parts may be made in the way mentioned. Between the fourteenth and sixteenth day a more or less remarkable change occurs in the patient. He becomes restless, anxious, his breathing is oppressed, the pulse quickened, tongue loaded, and the belly puffed up. At the same time come on colicky pains, palpitation of the heart, crying out in his sleep, troublesome dreams, rumblings in the belly, and so on ; from which discomforts the patient is relieved by a perspiration often continuing from twenty-four to forty-eight hours, and by increased secretion from the bowels and kidneys. On the sixteenth day another rubbing is to be made at evening, then on the next morning a purge, and so continuing to the twenty-fifth day, when, if there be not convulsions, severe oppression, great weakness, and so on, an early termination of the cure may be expected. On the twenty-sixth day the patient is to be put into a warm bath, and after half an hour washed quite clean with soap-spirit and a sponge, and dried. He is then to have fresh linen and to be carried into another room. The patient must during the

(*a*) Bemerkungen über die Syphilis und brauch des Quecksilbers in derselben ; in ihre verschiedenen Formen und den Ge- Rust's Magazin, vol. ix. pt. ii. p. 297.

(*b*) Above cited.

whole cure be kept in a regularly warm room, and should neither get up, change his linen, nor cleanse the parts smeared with the ointment.

848. The following are the principal symptoms to be observed during this cure. The salivation usually appears between the fourth and fifth rubbing in, and is only to be checked when severe. The inconveniences attendant upon it may be best diminished by syringing the mouth with mild or slightly astringent decoctions. If the tongue swell so that it squeeze itself between the teeth, a piece of cork must be introduced between the grinding-teeth. But if from its swelling there be danger of stifling, the cure must be suspended and the tongue scarified. Ulcers on the tongue and gums are to be touched with a mixture of a drachm of camphor to an ounce of oil of almonds. The patient must frequently move his tongue to prevent its growing together.

If the salivation appear before the third rubbing-in, a smaller quantity of the ointment must be used, and at more distant intervals. But the salivation frequently diminishes when the rubbing-in is continued, and nearly always if it be restricted to the evening. The salivation oftentimes continues after the cure is completed and ceases of itself. If during the whole cure there be no effect upon the salivary glands, it must not be forced; the hope of a happy result is then, however, always slight. In this case there often occur frequent intestinal and urinary evacuations, increased perspiration, and critical symptoms. Spasms, faintings, high fever, weakening perspirations, if occurring previous to the third rubbing in, and cannot be removed by chamomile and peppermint tea, by old wine, coffee, HOFFMANN's spirit, and require the suspension of the cure.

From my own experience I cannot recommend the modification of the *friction-cure* adopted by some, and formerly known by the name of the MONTPELIER treatment, or *steam-cure*, in which the diet is neither so strict, nor the rubbing-in made so regularly, or in such quantity as directed by LOUVRIER and RUST to produce salivation; but it is rather endeavoured to avoid it by suspending the rubbing-in, by purging, and so on; and then the friction is recommenced, and subsequently wood drinks are employed.

849. If the salivation or critical sweating be checked by cold and so on, in consequence of which severe spasmodic symptoms and even sudden death may ensue, the patient must be cleansed in a warm bath, put into a clean warm bed, the whole body rubbed with warm cloths, and with these also may be employed, mustard poultices, diaphoretics, and even emetics.

850. During the time of the evening frictions spasmodic symptoms, oppression, fainting, convulsions, nausea, and small contracted pulse, which often arise, are either forerunners of a second crisis, especially if the fifteenth day be not completed; or they are consequent on the use of purgatives. In the former case, stimulating remedies must be given; in the latter, the operation of the purgative must be stopped, and the next time a less powerful one given. But if under this treatment the symptoms do not subside, the treatment must be suspended.

851. When the cure is perfected, the patient, by the use of nourishing food, care being taken to avoid overloading the stomach, soon acquires a healthy blooming appearance: but if this do not follow, there is great probability of an imperfect cure. Should it be necessary still

to repeat the cure once more, the patient must be first recovered from the previous treatment.

852. WEINHOLD (*a*) employs a *grand Mercurial Cure* with calomel, which, as well as the friction cure, may be of greater service, and not only in old syphilitic, but also in rheumatic, scrofulous, and gouty diseases, as well also as in those cases in which often we are unaware on what the diseased action depends. Its object is, that a sufficiently large quantity of calomel should, at long intervals, so operate on the organism, that no salivation should be produced, because it would prevent the continuance of the calomel, and suspend the operation of the mercury on the unnatural reproduction.

853. In this cure the patient takes every evening, two hours before bed-time, on an empty stomach, a powder of ten grains of calomel and fifteen of sugar, and drinks two cups of warm beef tea; half an hour after, he takes a second like dose, and if he be a strong person, at the third half-hour he takes half a dose, so that together twenty-five grains of calomel and six cups of beef tea are taken. He then goes to bed, and drinks in the morning a couple of cups of moderately strong coffee, which usually produces three or four thin motions. If this do not happen at the tenth or twelfth hour after having taken the medicine, a powder of fifteen or twenty grains of jalap, and as much tartrate of potash, must be given in order to produce at least *one* evacuation. After two days' rest, the patient must, according to circumstances, take the same dose of calomel in two or three portions; on the seventh day, the third; on the tenth, the fourth; on the thirteenth, the fifth; on the sixteenth, the sixth; and the conclusion is made on the nineteenth or twenty-first day, with the seventh or eighth dose. As at the third and fourth dose, the stomach becomes accustomed to the irritation of the mercury, from five to six grains of jalap must be added to each dose. At the same time, a weak decoction of bark must be taken to support the reproductive powers, whilst the mercury destroys the dyscrasic. During this cure the patient must keep in-doors at least two or three hours in the forenoon, to promote perspiration; in not very bad weather he may, without harm, go about his business. The principal object of this treatment is, to produce stools, because they more certainly prevent salivation; but if that come on, which frequently happens in persons who have already used much mercury, the cure must be suspended.

854. ZITTMANN'S decoction (*b*) is to be used in the following manner:

(*a*) Von den Krankheiten der Gesichtsknochen und ihrer Schleimhäute der Ausrottung eines grossen Polypen in der linken Oberkieferhöhle, dem Verhüten des Einsinkens der gichtischen und venerischen Nase und der Einsetzung künstlicher Choanen. Halle, 1818. 4to. p. 36.

(*b*) ℞ Rad. sarsæ ℥xij. et coque cum
Aq. font. ℔xxiv. pro ½ hor., et adde
Alum. sacchar. ℥jss.
Merc. dulc. ℥iv.
Cinnab. antim. ℥j in nodul. ligat. sub fine coct. admisce
Fol. senn. ℥iij.
Rad. liquirit. ℥jss.
Sem. anis. vulg.
—— fœnicul. āā ℥iv.
Colat. lib. xvi. D. ad lagen, viii. S. *Decoct. forte.*

℞ Resid. decoct. fort.
Rad. sarsap. ℥vi. coq. cum
Aq. fontan. ℔xxiv. sub fine coct. adde
Pulv. cort. citr.
—— cinnamoni.
—— cardamom. āā ℥iii.
Rad. liquirit. ℥ij.
Colat. lib. xvi. D. ad lag. vii. S. *Decoctum tenue.*

on the first morning the patient takes sixteen portions of *pil. merc. laxant;* on the four following days he drinks in the morning a bottle of warm *strong*, and at noon a bottle of not warmed *weak* decoction; on the sixth day, again he takes the purging pills, as at first; and on the four following days, the decoction in like manner. Herewith the patient should eat only two ounces of roast meat, and as much white bread daily; and soup three times on those days when the purge is taken. The patient keeps in bed during the whole time, for the purpose of properly producing the perspiration. After the use of the decoction, he should keep his room for some time, drink infusion of *spec. lignorum*, or of sarsaparilla, and observe a weak diet. If the patient be not restored, the whole cure must be repeated a second time. In very robust persons, the purging pills must be once given on the eleventh day. The ulcers during the cure are merely to be cleansed with lukewarm water, and covered with charpie, either dry or spread with mild ointment. On an average, the use of the decoction is followed by five or six, and more, thin watery motions, and more or less, great perspiration. I have never noticed any accident which rendered breaking off this cure necessary. In largely spreading eruptions and very weak persons, it may be advantageous that only one bottle of the decoction should be drunk daily for the purpose of lengthening the cure by the prescribed diet. Frequently the pills are thrown up and then they must be again taken in divided doses. Nausea, disposition to vomit, and even actual vomiting, during the use of the decoction subside, if a smaller quantity of the decoction be drunk at one time. I have observed, in one instance, severe pain in the belly every time after taking the weak decoction, and frequently a gentle, not very lengthened salivation, has been noticed (*a*).

The Arabian treatment and dry diet resembles that with ZITTMANN's decoction (*b*).

Here also must be mentioned the plan of treatment proposed by DZONDI (*c*), in which the patient commences with one-fifth of a grain of sublimate in four pills, taken immediately after dinner; from day to day the medicine is increased by two additional pills, so that on the last day of the cure, which occupies twenty-seven days, thirty pills, or 1½ grains of the sublimate, is taken at a dose. All this time the patient lives moderately, keeps himself warm, and drinks sarsaparilla tea. If the cure be disturbed by salivation, after that has been relieved, the number of pills still remaining must be continued. If mercury have been previously immoderately or irregularly used, sulphur should be first employed internally or in baths.

(*a*) CHELIUS, Ueber die Anwendung des *Decoct.* ZITTM. in Vergleiche mit anderen gegen inveterirte Lustseuche und andere Krankheiten empfohlenen Behandlungsweisen; in Heidelb. klinisch. Annal. vol. i. pt. i. p. 116.

HACKER; in Heidelberger klinischen Annalen; in RUST's Magazin, vol. xxxix. pt. i. p. 1.—vol. lxvii. pt. ii. p. 203.

HABEL, Ueber die Heilkraft des ZITTMANN Decoctes in secündarer Syphilis; in Med. Jahrbüchern des östen Staates. Neue Folge, vol. ix. 1835.

MARTIUS, Einige Bemerkungen über das Decoctum ZITTMANNI; in Heidelberg med. Annalen, vol. ix. pt. iii. p. 418.

(*b*) S. GANDY, Aperçu sur l'efficacité du Traitément dit arabique dans les Maladies Syphilitiques ou anciennes ou dégénérées. Montpellier, 1827.

KLAATSCH; in RUST's Magazin, vol. xvii p. 177.

SCHÆFFER, Dissert. sur l'emploi du Mercure Sublimé et le Traitement arabique dans les Maladies Syphilitiques. Strasbourg, 1825.

(*c*) DZONDI, Neue zuverlässige Heilart der Lustseuche. Halle, 1832. Second Edit.—F. A. SIMON, jun., Ueber den sublimat. und die Inunctionskur, mit besonderer Beziehung auf DZONDI's neue zuverlässige Heilart von Lustseuche, und die LOUVRIER's RUST'sche Inunctionskur. Hamburg, 1826.

BARTELS einige Bemurkungen über DZONDI's neue Heilart der Lustseuche; in von GRAEFE und von WALTHER's Journ al, vol. ix. p. 513.

According to KLUGE (*a*), DZONDI's treatment is not *to be depended on;* in certain cases, however, especially in ulcers of the bones and nose, it is very efficacious.

855. In reference to the efficacy of the friction cure, of ZITTMANN's decoction and of WEINHOLD's treatment, I must undoubtedly give the preference to the former over the latter, which, according to my experience more frequently checks than actually cure the disease; often indeed it cannot be borne, and may often continue injurious and scarcely to be gotten rid of disturbance in the functions of the alimentary canal, which depend on a usual and peculiar treatment. The friction cure and ZITTMANN's decoction, in general, act more surely; but the latter is connected with by far less inconvenience to the patient, on which account, according to my present experience, I prefer ZITTMANN's decoction to the friction cure, and only employ the latter when the former has been inefficient. The effect of this decoction I have proved, not merely in all forms of syphilis, but also in other inveterate diseases.

Compare my above-mentioned statement, in which I have endeavoured to contradict the opinions put forward by NEUMANN (*b*) against the friction-cure, and in favour of WEINHOLD's mode of treatment.

What is the result of WEINHOLD's treatment, when, from the coming on of salivation, it be not determined to interrupt the cure, (which WEINHOLD and NEUMANN expressly enjoin,) I cannot from my own experience determine.

2.—TREATMENT OF SYPHILIS WITHOUT MERCURY.

856. The various diseased conditions which have been considered incompatible with the use of mercury, as great debility, with a disposition of the juices to deficient mixture, suppuration of internal organs, aneurisms, scorbutic diathesis, have, on the one hand, as also the evils ascribed to the use of mercury, have on the other, led to the proposal of the various modes of treatment *without mercury*. To these belong, the sudorific decoctions of the *radix sarsæ*, *caricis arenariæ*, *chinæ*, *astragali ex scapi*, *and bardanæ*, of the *lignum guiaiaci*, *cortex mezerei*, *stipites dulcamaræ* and green walnut shells. POLLINI's decoction, the *rob anti-syphilitique* of LAFFECTEUR, the sarsaparilla cure of ST. MARIE, (drank like mineral water,) VIGOROUX's drink, the hunger cure of OSBORN and STRUVE, the volatile alkalies, (BERNARD's *Tinctura anti-syphilitica*,) various antimonial preparations, the acids, especially muriatic acid, gold, especially its muriate (1); hydriodate of potash, and various other remedies. These modes of treatment were, for the most part, less destined for the primary, than for the secondary and older symptoms of the venereal disease, especially for those where much mercury had been

(*a*) Bericht über die, auf höheren Befehl mit der DZONDI'schen Heilmethod gegen die Lustseuche in dem Berl. Charité-Krankenhause angestellten Kurversuche und deren Resultate, nebst Gutachten über die Methode selbst; in RUST's Magazin, vol. xxvi. p. 211.

(*b*) Vergleichung der LOUVRIER'schen und WEINHOLD'schen Methode, das Quecksilber anzuwenden; in VON GRAEFE und VON WALTHER's Journal, vol. iii. p. 405.

WITTCKE, Dissert. de WEINHOLDII Hydrargyrum adhibendi methodo. Berol. 1821.

NEUMANN, über die Lustseuche; in VON GRAEFE und VON WALTHER's Journal, vol. xvii. p. 1.

HEINZE, Ueber die Bekämpfung der Lustseuche durch eine modificirte Inunctionskur, u. s. w. Wien, 1836.

already used without effect; or where, on account of the state of the constitution, its use could not be borne. The greater number of these remedies had merely ephemeral reputation, and could not supplant mercury.

See my opinion already given upon ZITTMANN's decoction, in which the greater number of these modes of treatment have been more fully mentioned, and their effects compared.

Gold, first substituted for mercury by PITCAIRN, but especially introduced by CHRESTIEN, was as gold filings, gold powder, oxide of gold, and muriate of gold, (CHRESTIEN's salt of gold,) recommended in primary and secondary syphilitic affections; it increased the appetite, raised the pulse and heat, produced thirst, burning of the gums, salivation, (of a milder character without smell, without ulcers, and not exhausting as when mercury is used,) febrile re-action, sweating, increased secretion of urine. It called forth the syphilitic symptoms previously suppressed, and the recovery when it took place was permanent. The effect is greater in using the salt, less in the use of the oxide, and weakest with the powder. In an irritable state it could not be employed. Of the gold powder, the first grain was divided into twelve, the second into eleven, the third into ten, and the fourth into nine parts; it was used so many days as there were parts into which the medicine had been divided, and it was rubbed into the tongue, the gums, or the sensible parts of the face. In buboes and very painful ulcers, rubbing in the powder or salts of gold was effected with cerate. Very numerous observations show that the effect of the gold against *syphilis* was much less and more uncertain than CHRESTIEN and NIEL had held: in our climate, large doses (according to my experience) are required to bring about the before-mentioned results. In irritable constitutions gold is a dangerous remedy (*a*).

RICORD (*b*) treated in 1824 of the use of iodine in gonorrhœa and bubo; EUSEBE DE SALLE is fond of it in hard swellings of the testicles, and also LALLEMAND, BIETT, and PAILLAND; but especially WALLACE (*c*), ROBERT WILLIAMS, M. D., JUDD (*d*), TYRRELL (*e*), EBERS (*f*), VON HASSELBERG and others (*g*) have used the hydriodide of potash in the different forms of the general venereal disease, and in doubtful cases, with remarkable success. The iodine tincture, the hydriodic acid and iodine strong have been used; the hydriodide of potash, however, with especial success. According to WALLACE, two, three, or four table-spoonfuls, and according to HACKER (*h*) eight or nine spoonfuls daily are given, of a mixture composed of hydriodide of potash two drachms, and distilled water eight ounces. Its operations generally are increase of the vital activity, cheerfulness, increased appetite, increase of flesh, brighter colour of the skin, return of sleep, greater activity of the excreting organs; sometimes diarrhœa and colic; in one case salivation occurred (*i*). The hydriodide of potash is especially efficient in secondary syphilis, with increase of substance particularly in the bones and skin. HACKER observed in eleven cases that there was always remarkably quick improvement, but not proportionately quick cure. The treatment must often be continued for more than two months. According to EVERS, the urine is to be tested during the cure with sulphuric acid, with solution of starch or of chlorate of lime.

(*a*) CHRESTIEN, Méthode iatraleptique,—Paris, 1814. Second Edit.

GOZZI, Sopra l'uso di alcuni remedii aurifici nelle Malattie Veneree annotationi teoretico-pratiche. Bologna, 1817.

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ODHELIUS; in HUFELAND's Journal, vol. xliv. p. 117.

DELPECH, above cited.

(*b*) Journal Complément., vol. xix.

(*c*) WALLACE, above cited.

(*d*) JUDD, A practical Treatise on Urethritis and Syphilis. London, 1836.

(*e*) TYRRELL, On the use of Iodine in Syphilis.

℞ Iodin. gr. ½; potass. iod. gr. ½; syr. papav. ℥iv. aq. destill. ℥viij. Ft. mist.; coch. duo ter die sumend.

(*f*) EBERS, Ueber Anwendung des Kali hydrojod. gegensecundäre Lustseuche; in med. Veriarzeitung in Preussen, 1836, 5 October.

(*g*) STABEROH; in CASPER's Wochenschrift, 1838. No. 5.

(*h*) HACKER; in Summarium, u. s. w., vol. viii. part vii. 1836.

(*i*) BUTLOCK; in Edinb. Med. and Surg. Journ., 1837.

[(1) Forster gives some cases (*a*) of syphilis cured by the conjoined use of chloride of gold and soda, and observes, "in all these cases and in some which have since occurred, the only *evident* effect of this remedy was, the perspiration, which gradually diminished in quantity as the system became accustomed to the stimulus. In only one case was any dressing but dry lint applied, and this difference did not seem to be influential." The form of preparation of this remedy was the following: —"Dissolve ninety-six grains of pure gold in nitro-muriatic acid; evaporate and crystallize; dissolve the crystals of the chloride of gold obtained, in pure water; add thirty grains of *decrepitated* chloride of soda. Evaporate the solution and crystallize. The salt is slightly deliquescent, and must therefore be kept in a stopped phial."

857. In England, however, the treatment without mercury, formerly restricted to the so-called pseudo-syphilitic diseases, has been extended to all syphilitic affections, and this has been continued and mercury discarded for more than eighteen years in the greater number of the military hospitals, and by many of the most distinguished civil practitioners (1). The mode of treatment is the following:

In primary syphilitic sores, as long as their inflammatory character continues local, and in severe inflammation general blood-letting must be employed, especially in phimosis and paraphimosis; the patient must preserve the strictest quiet, and be continually in the horizontal posture; he must use purging neutral salts and strict antiphlogistic diet. The local treatment of the ulcer is to be guided only according to its special condition and not with reference to a specific contagion. In painful sores with everted, hard, irregular edges, and scabs, softening anodyne fomentations and applications must be used two or three times a-day; and after these symptoms have subsided, solutions of lead, of sulphate of zinc and copper, lime water, and so on. In phagedenic and gangrenous sores, whilst inflammation exists, bleeding must be employed, with strict antiphlogistic diet, softening anodyne applications, afterwards solutions of lunar caustic, diluted sulphuric acid, tincture of myrrh, turpentine and similar remedies, in which the frequent change of the remedies specially promotes the healing, and very much seems to depend on keeping the dressings moist. In indolent ulcers more stimulating remedies must be employed. By this treatment all ulcers of the generative parts may, without exception, be healed in a short time. The dispersion of buboes is to be promoted by a compressing bandage, and in their painful state they must be treated by the frequent application of leeches. If suppuration occur, the abscess must be opened with caustic, and the wound afterwards treated as a primary sore. Secondary symptoms, when occurring after the just-mentioned treatment, appear as inflammation of the throat, eruptions of various kind, inflammation of the eyes, periostitis, and swellings of the bones. If these symptoms be very mild they may be cured by sudorific woody drinks, antimonials, strict diet, and antiphlogistic treatment, agreeable to circumstances. Severe and dangerous symptoms, as great and continued pain in the bones, *caries*, destructive ulcers, of the throat and other parts, will never be seen after this treatment.

[As regards the continuance of this treatment, the frequency of buboes following upon primary ulcers, and subsequently the occurrence of secondary symptoms, the opinions of English practitioners differ from each other. According to Hill, ulcers

(*a*) Lancet, 1829–30. vol. ii. p. 590.

with the proper syphilitic character heal in from eight to twenty-five days; according to Hennen, the primary in fifty-five and the secondary in from fifty-five to eighty-five days. Previous mercurial treatment and scrofulous constitution have special influence on the difficulty of the cure. The proportion of the secondary to the primary symptoms is, according to Rose, 1 : 3; to Guthrie, 1 : 10; to Thomson, 1 : 12; to Hennen, 1 : 5; and to Hill, 1 : 10.

(1) It must not be supposed that the practice of treating syphilis without mercury is at all the general practice throughout England; for beyond all doubts it is decidedly the reverse, as the treatment of these cases in almost all, if not all, the civil hospitals, and by the greater number of surgeons proves. It is not to be supposed, however, that mercury is used in the profuse and improper manner in which in former times, and even within my own recollection, it was employed for true syphilitic symptoms, either primary or secondary. Nor indeed is it used for all or for a large proportion of sores on the genitals, in which heretofore it was indiscriminately prescribed. The surgeon now first takes care to discriminate between the syphilitic and non-syphilitic sore, and adapts his treatment accordingly, with mercury, under careful regulations, for the former as a specific, but for the latter, as either an alterative, or simply as an occasional purge, taking care at the same time to improve the general health by diet, medicine, and good air.

Far from employing mercury too frequently or too freely, the fault is now rather in the contrary direction, and an imperfect cure is the result of leaving off that medicine too quickly, and not continuing it a week or ten days or more after the symptoms have apparently subsided, whilst in reality the syphilitic poison has not been entirely cast out. The consequence of this is, that secondary symptoms, especially eruptions, are, so far as I have had opportunity of observing, much more frequent than formerly. The surgeon therefore should be especially cautious, that whilst he avoids overdosing with mercury, in whatever form it be used, that a sufficient quantity should be administered to affect the constitution fully, and this should be steadily, though moderately, kept up till some days after all symptoms have disappeared. Chelius's own observations in the following paragraph fully bear out all here mentioned.—J. F. S.]

858. Many of the objections formerly made against this plan of treatment when the here mentioned observations had not been sufficiently numerous nor sufficiently long continued, though the pseudo-syphilitic affections were cured by it, but not the true syphilis, have on the contrary lost all weight, if it be remembered how long this treatment has been employed, and by some of the most experienced and best instructed English practitioners. The frequency of the secondary symptoms always remains as the most important objection; but seeing that we are still in want of careful and sufficiently numerous statements in reference to the employment of mercury, so must, after the impressive testimony of the English practitioners, the mild and by far less destructive character of the secondary symptoms outweigh this objection. Certain as it may be on the other hand, that by the *immoderate* use of mercury, syphilis assumes a peculiar destructive character, so little can I, however, agree with the banishment of mercury in the treatment of syphilitic diseases, that I am convinced by experience, that a moderate use of mercury, with a strict and corresponding dietetic treatment, effects more quickly and constantly the cure of syphilis. The reproach, that the mercurial treatment of syphilis first imparts to it a direct destructive character, applies, only to the negligent, common use of this remedy without reference to the constitution, and without correspondent mode of living. It is satisfactory in other respects to know, that in those conditions which especially contra-indicate the use of mercury, this treatment may be employed with confidence.

For the literature of this subject, see—

Ferguson, Observations on the Venereal Disease in Portugal, as affecting the Constitutions of the British Soldiers and Natives; in Med.-Chir. Trans., vol. iv.

Rose, Observations on the Treatment of Syphilis, with an account of several cases of that disease in which a cure was effected without the use of Mercury; in Med.-Chir. Trans., vol. viii. p. 349.

Guthrie, On the Treatment of the Venereal Disease without Mercury.

Hennen, John, Observations on the cure of Syphilis without Mercury, &c.; in Edinburgh Med. and Surg. Journal, vol. xiv. p. 201, 1818.

Hill, Saml., M. D., On the Simple Treatment of Syphilis without Mercury; in Edinburgh Med. and Surg. Journal, vol. xviii. p. 567. 1822.

Thomson, John, Observations on the Treatment of Syphilis without Mercury; in Edinburgh Med. and Surg. Journal, vol. xiv. p. 84.

Alcock, Observations on the successful Treatment of Syphilis in its primary stage without Mercury; in London Med. Repos., vol. ix. p. 489.

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Phiney; in New England Journal, vol. ix. p. 235.

Ware, ibid. vol. iv. p. 354.

Stevens; in Med. and Surg. Register of the New York Hospital, part ii. 1820.

[Harris, Thos., in N. American Med. and Surg. Journ.—G. W. N.]

Todd; in Dublin Hospital Reports, 1810, vol. ii. p. 147.

Krüger, Darstellung der jezt in England, üblichen Behandlung venerischer und Syphilitischer Krankheiten ohne Mercur; in Horn's Archiv., 1822, Jan. Feb., p. 99.

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Fricke, Annalen der Chirurgischen Abtheilung des allgemeinen Krankenhauses in Hamburg, vol. i. Hamburg, 1828.

Wilhelm, Clinische Chirurgie; mit Kupf. München, 1830. 8vo. vol. i.

SYPHILIS IN INFANTS.

[Infant children are occasionally affected with *syphilis*, either whilst still in the womb, during birth, or from sucking a diseased nurse. The latter two modes of infection are those generally admitted, but Evanson and Maunsell state that "the first mentioned has been in their experience by far the most usual, and that they have not in their own recollection any cases decidedly proving the occurrence of the third." I do not, however, see any sufficient reason why infection during delivery should be infrequent, as it is far from uncommon that the medical attendant of a woman with primary sores, and whose hands are not long in contact with the sores, becomes subject of chancre. Evanson and Maunsell state that the communication of *syphilis* to the *fœtus* in the womb "happens commonly in one of the following ways: one or both parents may have the disease at the time of the conception of the child, or they may have had it previously, and perhaps, at the period in question, present no sign of ill health whatsoever. Under either of these circumstances a child may be born apparently healthy, and continue so for an uncertain period, varying from a fortnight to five or six months,) when marks of *syphilis* may show themselves; the most usual period for the disease to appear, is, according to our experience, from the third to the fifth week." (Huguier (*a*) says

(*a*) Archives Générales de Médecine. Aug., 1840.

that *syphilis* shows itself in an infant in from three to thirty days after birth.) "In this way the symptoms may be developed in several successive children of the same parents, but usually such cases are alternated with miscarriages or premature births of children, dead and covered with syphilitic eruption; or all these occurrences may take place in the same family; for example, a woman may miscarry once or twice; may then produce a dead syphilitic child, and subsequently give birth to one apparently healthy, but showing disease when it has attained the age of four or five weeks. There is no regular succession in the occurrence of these different events, as they indifferently precede or follow each other. During the whole period of the production of these diseased children, both parents may appear perfectly healthy, and one of them may never have had any sign of the disease." The child may also be infected from a syphilitic nurse, but whether simply from the infected milk, or whether only from sore nipples, I am not prepared to state; for though DYCKMAN (*a*) maintains that a child may become diseased simply by the milk of an infected nurse, LAWRENCE's case presently mentioned, however, seems to disprove this statement. But, on the other hand, the child can infect the nurse of which the case related by JOHN HUNTER (p. 413) as one instance of disease resembling *syphilis*, is a most excellent example, for the history of the case proves beyond all doubt that the disease was genuine *syphilis*, and the child successively infected three wet-nurses, by the first two of whom their own children were consequently infected. LAWRENCE also mentions a case in which a syphilitic child gave the disease to a healthy woman who nursed it, but at the same time, her own child having been kept at the other breast, did not receive it. "The woman that so nursed this child had a primary sore on the breast, an affection of the absorbent glands, and an eruption over certain parts of the body similar to what we would regard in other cases as secondary symptoms of the venereal disease. The child then appearing to be well, was put to a second nurse, who had also a primary sore on the breast, and eruptions on the body; she became pregnant and five weeks after delivery her infant was covered over from top to toe with syphilitic eruptions." (p. 783.) Whether in these cases the nurse be infected through a sore on her nipple, or merely by the application of the poison to the skin, is disputed. COLLES doubts whether the child can infect the nurse unless she have ulceration of the nipple. TODD mentions (*b*) a very remarkable case of an old woman of seventy years of age who spoon-fed her grandchild which was infected with *syphilis*, and died a fortnight after birth. Three days after the woman had a rash on the arms like itch, and in three or four days more she had excrescences on the *labia*, a few elevated blotches on her breast and back, and a deep ulcer in each tonsil. This woman was speedily cured by the mercurial treatment.

When a child is born dead, and has been so for some time previous, its putridity prevents determination from its appearance of the existence of the disease; but when born alive, the child appears healthy for an uncertain period (from a fortnight to five or six months) after birth. The first distinct symptom usually is the occurrence of a peculiar mode of breathing through the nose, known by nurses as the *snuffles*, (and depending on the nostrils being inflamed and stuffed with a thick viscid yellow secretion); at the commencement this is attributed to cold, and seldom attended to until the eruption appears. In the interim, however, the child's health is much affected, and without any obvious reason. It has no bowel complaint, and is not undergoing dentition, but yet wastes away, and is feverish, fretful, and pallid. In about a fortnight an eruption comes out rather suddenly, at first upon the lower extremities and buttocks, and subsequently upon the face and body; * * * first in the form of copper-coloured blotches, about the size of a split pea, and slightly raised above the level of the skin. These are, in a slight degree, moist upon the surface, and in situations exposed to the air they soon become scaly, and subsequently are converted into dark-yellowish scabs. Where portions of skin are naturally in contact, as between the buttocks, in the wrinkles of the neck, &c., scales are not formed, but raised condylomatous sores. As the disease advances, the skin in the intervals of the scabs becomes throughout of a copper colour, and perpen-

(*a*) On the Pathology of the Human Fluids.

(*b*) Surgical Report, containing an account of those Affections of the Penis which are generally considered as primary symptoms of Syphilis, &c.; in Dublin Hospital Reports, vol. ii. p. 182.

dicular fissures are formed in the lips, giving the mouth a very peculiar and characteristic appearance, which cannot be verbally described, but to those familiar with the disease, is in itself diagnostic of its real nature. The voice at this period becomes feeble and stridulous; the inside of the mouth often covered with *aphthæ*; extreme emaciation attends, and, if medical aid be not afforded, the child is reduced to a state of excessive debility, and lies covered with disgusting scabs and ulcerations." (Evanson and Maunsell.) In addition to these, Lawrence mentions that he has seen two cases of *iritis* as symptoms of *syphilis* in infants; and that sometimes there are ulcers pretty much indurated, that is, with a superficial edge, and rather indurated base, about the *anus*. "The *diagnosis* is to be derived partly from its history, but in investigating this the greatest caution is required, as a hint of any suspicion upon the subject might, in many instances, be productive of the most unhappy domestic results. * * * The snuffles of *syphilis* having nothing at first to distinguish them from those of common catarrh, the disease with which the eruption is most likely to be confounded is common itch, which in the delicate skin of the child may assume a frightfully severe form. It is to be known from *syphilis* by its pustular character, by the itchiness which it occasions, and by the absence of the copper colour of the skin, and the peculiar fissured appearance of the mouth. Itch is also commonly communicated to the attendants. * * * The *prognosis* is always favourable when the case is seen early and properly treated, few diseases being more under the influence of medicine. If left to itself, however, *Syphilis infantum* is certainly fatal.

"The *treatment* is exceedingly simple—mercury being always required, and, when judiciously exhibited, seldom failing to produce a beneficial effect. * * * Administer from one to two grains of *hydragyrum cum cretâ* two or three times a-day (according to the age) until the eruption and snuffles disappear. The child usually fattens under this treatment; and salivation is never produced, at least we have never seen it, in a child under three years of age. Should the mercury affect the bowels, which sometimes happens, we must combine with each dose from half a grain to a grain of Dover's powder, or of the powder of chalk and opium. The time required for treatment is from six weeks to two or three months, and the medicine should always be continued for two or three weeks after every symptom has disappeared; even when this precaution has been observed, the disease may return and the mercurial treatment must be again and again resumed." Black wash or dilute citrine ointment may be applied to the sores, and when they become indolent they may be stimulated with nitrate of silver or sulphate of copper. Giving mercury to the nurse so as indirectly to affect the child is insufficient for the cure of the disease in the latter. When the mother is suckling her own child it will be well to treat her with alteratives, as for example, sarsaparilla; but unless she labours under actual syphilitic symptoms the giving of mercury to her should not be thought of until the child is weaned, as by affecting her general health it would be likely to deteriorate her qualities as a nurse." (Evanson and Maunsell.) Some practitioners make use of corrosive sublimate in treating syphilitic infants; but it is objected to both by Swediaur and Bacot as likely to disagree and produce violent griping.

In connexion with this subject one very important question may be here adverted to, namely, whether *syphilis* can be communicated by co-habitation, if the husband labour only under secondary symptoms. Hey is, of opinion that the wife may be so infected, although he is not able to state any positive facts supporting it. Lawrence also says that the same is the impression on his mind from circumstances that have come under his own observation; and Todd's case of the grandmother already mentioned might be brought in support of these views, as in her case as well as in those of married people, the only conceivable way of the infection being communicated is, the application of the secretion of the secondary sores to the surface of the healthy party. It must not, however, be forgotten that Hunter, from experiment, asserted that the secretion of secondary sores is not infectious, and Ricord says that his own experiments on the same point have confirmed Hunter's statement. The possibility of infection from secondary *syphilis* would therefore seem more than doubtful; and I am rather disposed to believe, that in cases where it is said to take place, that the male patient purposely deceives his medical attendant with a false history of his ailment or of the correctness of his moral conduct after marriage, than that two so able and attentive observers as John Hunter and Ricord should be in error. Be this however as it may, the con-

sequences to the female and her children are so distressing and so serious, that in my opinion an infected person ought not to be allowed intercourse with his wife; or should at least be warned of the results which, according to the opinions of some able and experienced surgeons, might by possibility accrue from such intercourse. —J. F. S.]

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859. The immoderate and too long-continued use of mercury, especially with improper dietetic treatment, and catching cold, produces a peculiar cachexy, which has been first well described within the last thirty years, as the *Morbus Mercurialis* (1), *Erethismus Mercurialis* (2), *Erythema*, and *Exanthema Mercuriale*, &c.

This disease has various stages, and appears,

1. As an *eruption* which generally occurs on suddenly catching cold, during the use of mercury; it is preceded by a feeling of great debility, oppressive sensation at the pit of the stomach, and frequent horripilations, followed by increased heat, quick pulse, headach, *nausea*, and thirst; then pale or dusky-red vesicles, rarely a purple-red eruption without vesicles, or similar to nettle-rash, appear most commonly first on the purse, on the insides of the thighs or fore-arms, and gradually spread over the whole body. After a shorter or longer time, the cuticle is shed in thin whitish scales; but if the ailment be left to itself, a large quantity of vesicles or pustules arise which contain an acrid, stinking, very irritating fluid, and on their bursting more or less thick crusts are formed by the drying of the fluid (3).

2. As *ulcers* in the throat and mouth which are characterized, not

merely by their grayish-white and flabby appearance, but also by their whole external form, which is more easily distinguishable by the eye than to be described by words. Pain and tension arise in the soft palate, and in the tonsils, with heat and a peculiar sensation of dragging of the palate towards the hinder part of the nostrils; much excoriation on the soft palate, the *uvula*, and tonsils, and actual ulcers, having the appearance of whitish discoloured spots, especially on the hinder wall of the *pharynx* (4). A peculiar characteristic is the disposition the ulcer shows to change its place. Even true syphilitic sores may, by the too long continued use of mercury, degenerate into mercurial sores. As the disease proceeds the pendulous palate is destroyed, and *ozæna*, *caries* of the nose-bones, pains in the bones, (wanting, however, the nightly exacerbation), enlargement of the bones, and *caries* occur.

Upon the varied appearances and degrees of the mercurial cachexy, see the before-mentioned excellent Paper of DIETRICH.

[(1) CARMICHAEL does not hold with the notion of a mercurial disease. He says:—"In ascribing those symptoms (mercurial chancres, ulcers, pains, &c.) to mercury, we have entirely overlooked this obvious circumstance, that *that* medicine, when exhibited even to profusion for liver, or any disease which is not venereal, has never in any one instance produced those results. With respect to the deteriorating influence of mercury, I am perfectly willing to allow, that when it does not altogether supersede the actions of a morbid poison, it may so far alter or modify its symptoms, as to change, in a great measure the appearance and natural progress of the disease, but this is essentially different from an admission, that the remedy will produce symptoms which can scarcely be distinguished from those of the poison itself." (p. 46.)

LAWRENCE observes:—"Among the prejudicial effects of mercury, are enumerated, by those who are unfavourable to its use, eruptions, *iritis*, affections of the nose, affections of the bones, and affections of the joints, that is, a considerable portion of those symptoms which we know are secondary symptoms of *syphilis*. It has been contended by those who in modern times have been the great advocates for the treatment of *syphilis* without mercury, that a great portion of those symptoms ordinarily described as secondary, are really owing to the action of the remedies employed to counteract the *syphilis*. Now, in the first place, we may observe that all these symptoms may be produced without the employment of mercury; we know perfectly well that each of them is seen in individuals who have taken no mercury at all. We have, therefore, clear evidence that all these effects may be produced by the disease. We have not the same evidence that they may be produced on the contrary, by the employment of mercury. Mercury is given in many cases besides those of *syphilis;* it is given to a very considerable extent in other cases, but in no instance where it is given in other diseases do we find it produce eruptions like syphilitic eruptions; in no such instance, do we find it produce *iritis*, swelling of the nose, or of the bones, or of the *periosteum*. The effects then, in question can be produced by pox without mercury, but we have not the same evidence that they can be produced by mercury without pox; now, it is true, that mercury and pox acting together may produce a something that neither would produce singly. I can readily admit that the injudicious use of mercury; that the employment of it in cases in which it ought not to be used; that persevering in the employment of it in cases where it exerts one or other of its noxious effects, may aggravate the symptoms, may tend to produce their return, more readily make them more difficult of cure; and thus, I think, we can have no difficulty in admitting that the employment of mercury, under such circumstances, may add to the difficulties which may attach to the disease itself. I cannot, however, for my own part, see any evidence that mercury is capable of producing those effects which we are in the habit of observing from syphilitic poisons in cases where no mercury has been used." (pp. 731, 732.)

To the same effect, also, TRAVERS (*a*) observes, in speaking of syphilitic cachexia:

(*a*) A further Inquiry concerning Constitutional Irritation, &c. London, 1835. 8vo.

—"Mercury, it may be said, has much to do with the production of this cachexia; as an aggravant, I do not deny this to be frequently the case, but not as an element." (p. 87).

(2) The *Erethismus mercurialis*, as it was named by JOHN PEARSON, differs from either of the two forms of mercurial affections mentioned by CHELIUS, as from it results no local manifestations, but merely disturbance, severe enough indeed, of the constitutional powers. PEARSON's attention appears to have been directed to this formidable complaint, by having "observed that in almost every year one, and sometimes two instances of sudden death occurred among the patients admitted into the Lock Hospital; that these accidents could not be traced to any evident cause, and that the subjects were commonly men who had nearly, and sometimes entirely, completed their mercurial course." (p. 154). He obtained no satisfactory information by inquiring of his colleagues as to the cause of these fatal cases; but after having given "a constant and minute attention to the operation of mercury on the constitution in general, as well as to its effects on the disease for which it was administered, and after some time had elapsed, I ascertained," says he, "that these sinister events were to be ascribed to mercury acting as a poison on the system, quite unconnected with its agency as a remedy, and that its deleterious qualities were neither in proportion to the inflammation of the mouth, nor to the actual quantity of the mineral absorbed into the body. The morbid condition of the system which supervenes on these occasions during a mercurial course, and which tends to a fatal issue, is a state which I have denominated *Erethismus* (*a*); and is characterized by great depression of strength, a sense of anxiety about the *præcordia*, irregular action of the heart, frequent sighing, trembling partial or universal, a small, quick, and sometimes an intermitting pulse, occasional vomiting, a pale contracted countenance, a sense of coldness, but the tongue is seldom furred, nor are the vital or natural functions much disordered. [What then are to be considered the symptoms just mentioned.—J. F. S.] When these, or the greater part of these symptoms are present, a sudden and violent exertion of the animal power will sometimes prove fatal; for instance, walking hastily across the ward; rising up suddenly in the bed to take food or drink; or slightly struggling with some of their fellow patients, are among the circumstances which have commonly preceded the sudden death of those afflicted with the mercurial *erethismus*." (p. 155–57). BURDER says (*b*):—"This peculiar irritation may arise from the administration of mercury in any form, and may occur during any period of a mercurial course, though most commonly at its commencement. The exact circumstances which favour its occurrence in the particular individuals attacked have not hitherto been ascertained. While resident medical officer of the Lock Hospital he has seen it produced by the inunction of a single drachm of mercurial ointment, and reproduced in the same individual after the discontinuance of the medicine for a whole month, by three frictions, each consisting of only one drachm of the ointment. It is remarkable, however, that in the greater number of instances, a full and adequate course of mercury has been afterwards borne without any recurrence of *erethismus*, by the very persons who had suffered from it during the commencent of the course." (p. 105).

The seeming rarity of this disease, even "in public institutions where the atmosphere of the wards was actually loaded with the remedy," (mercury,) "would," as BACOT has very justly observed, "be a very imperfect mode of estimating the frequency of the occurrence of *erethismus*; because although few die, very many persons have been affected by it in an inferior degree, without, in fact, being at all aware of the cause of their sufferings." (p. 272). To this I would, however, add, that this violent degree of constitutional disturbance is now rarely if ever seen even in hospitals, not only because their syphilitic wards are no longer polluted by a mercurial atmosphere, but because surgeons, using mercury in the treatment of *syphilis*, take especial care to suspend or give up its use, when the constitutional symptoms show that the mercury is beginning to do mischief, and if persisted in would excite the irritable condition above described.

The relation of Dr. BATEMAN's own case by himself (*c*) is probably the best

(*a*) Principles of Surgery. London, 1788. 8vo.

(*b*) FORBES, TWEEDIE, and CONOLLY's Cyclopædia of Practical Medicine, vol. ii.—article, *Erethismus Mercurialis*.

(*c*) Notes of a Case of Mercurial Erethism; in Med. Chir. Trans. vol. ix. p. 220.

account of this disease. Being the subject of *amaurosis*, he rubbed in a drachm of strong mercurial ointment nightly; on the seventh day his gums were a little tender, and he had slight fever at night; on the eighth he was languid and feverish, and the gums reddish and spongy; on the following day he had violent and irregular action of the heart, which did not yield to laudanum or stimulants, but went off suddenly in the afternoon; on the next two days he was severely griped and purged; on the tenth day, the mouth being sore, and the irregularity of the circulation continuing, the mercury was omitted, but as he was more comfortable on the following day, it was resumed, but the palpitation returned, and continuing on the twelfth day, the mercury was abandoned. During the whole of the following month the symptoms of irregular action of the heart, of extreme debility, and a strong tendency to *syncope*, accompanied with cough, evidently proceeding from a deranged stomach, and attended with violent retchings, continued to increase in severity, and his condition became very precarious. No solid food could be taken without an alarming increase of the feelings of oppression and faintness; and stimulants, as brandy in small quantities, *ammonia*, and *æther*, were principally beneficial. Among the most curious circumstances of this case, was the impossibility of attaining sleep even for a very short period, without bringing on the most painful sense of suffocation and distress, so that he was obliged to be removed immediately into a current of fresh air. These attacks were so violent, and recurred so frequently, as to entirely banish sleep. He recovered, but for more than a twelvemonth after, complained of a hurried circulation, want of strength, and lassitude."

Pearson speaks of a *Cachexia syphiloidea*, of which he says, he has "not yet attained to that complete and satisfactory knowledge which would authorize him to obtrude a publication on the subject; but," observes, "the experience I have already had in the treatment of that multiform disease, has taught me that it may appear under the following different circumstances:—1. Where the syphilitic virus has lately existed in the constitution, and the patient has employed the accustomed course of mercury; 2. Where the patient has been repeatedly diseased with *syphilis*, and has used several courses of mercury; 3. Where a great length of time, from three to twelve, and sometimes twenty years, has elapsed since the patient has been exposed to the agency of the disease and its remedy ! ! 4. After the *gonorrhœa*, where small quantities of mercury have been used; 5. Where no venereal complaints, general nor local, have preceded the appearance of the *Cachexia syphiloidea*, and where the patient has never been exposed to the hazard of contracting that disease, nor has laboured under complaints requiring the aid of mercury." (pp. liv. v). This is all he says upon the subject, and why he should prefer applying the term *Cachexia syphiloidea* to *Cachexia mercurialis*, which the disorder undoubtedly is, does not appear very satisfactory. No more reasonable is Bacot's persistance in using the same title, under which he well enumerates the symptoms which occur in this affection, to wit, "emaciation, long-continued, and severe nocturnal pains and enlargement of the bones; severe and extensive ulcerations, fever, profuse perspiration, followed not unfrequently by hectic fever and death. The most usual history which a case of this kind affords, is that of a patient, who, perhaps for some common sore of no great extent or severity, has employed mercury until his health has given way, and until symptoms have arisen of so equivocal a nature as to lead to the belief that the original disease is making inroads into the constitution; it is under this conviction that the patient either devotes himself to a fresh course of mercury, or his surgeon, if a decided mercurialist, advocates the same plan; from that moment the disease becomes complicated; bone generally becomes affected, fresh attacks of nocturnal pains, new and unobserved forms of eruption make their appearance, and are all referred to the original poison, until perhaps a severe form of fever is excited, or some local mischief obliges a discontinuance of the treatment. Then it is that the patient rallies, the constitution appears daily to acquire strength; but, as in this condition it is not unusual for the osteopic pains to be renewed, and partial relapses to take place, the fatal misapprehension is again renewed, until another exhibition of mercury effectually overpowers the efforts of nature, and the patient sinks under the exhausting influence of the remedy." (pp. 276, 77).

"The mercurial cachexia," says Travers, "is characterized by irritable circulation, extreme pallor and emaciation, an acute and rapid hectic, and an almost invariable termination in *phthisis*, the utter destruction of the palate, extensive cicatrices, eruptions, or ulcers of an anomalous character in various parts of the body, and large cranial exfoliations are seen in combination with it." (p. 87).

(3) This disease is called *Eczema rubrum* by WILLAN and BATEMAN, who state that it "is not exclusively occasioned by mercury, either in its general or more partial attacks; it has been observed to follow exposure to cold, and to recur in the same individual at irregular intervals, sometimes without any obvious or adequate cause." (p. 254.) "The quantity of this ichorous discharge," says these distinguished writers, "is very considerable, and it gradually becomes thicker and more adhesive, stiffening the linen which absorbs it, and which thus becomes a new source of irritation; it emits also a very fetid odour. This process takes place in the successive patches of the eruption, until the whole surface of the body, from head to foot, is sometimes in a state of painful excoriation, with deep fissures in the bends of the joints, and in the folds of the skin of the trunk; and with partial scaly incrustations of a yellowish hue, produced by the drying of the humour, by which also the irritation is augmented. The extreme pain arising from the pressure of the weight of the body upon an extensive portion of such a raw surface, is sufficient to give rise to an acceleration of the pulse and white tongue, but the functions of the stomach and of the *sensorium commune* are not evidently disturbed by this disease. The duration of this excoriation and discharge is uncertain and irregular; when only a small part of the body is affected it may terminate in ten days, but when the disorder has been universal, the patient seldom completely recovers in less than six weeks, and is often afflicted to the end of eight or ten weeks. By so severe an inflammation the whole *epidermis* is destroyed in its organization; and when the discharge ceases it lies loose, assuming a pale brown colour, which changes almost to black before it falls off in large flakes. As in other superficial inflammations, however, the new red cuticle that is left is liable to desquamate again, even to the third or fourth time, but in smaller branny scales of a white colour, and a roughness sometimes remains for a considerable period, like a slight degree of *psoriasis*. In some instances, not only the cuticle but the hair and nails are also observed to fall off; and the latter, when renewed are incurvated, thickened, and furrowed, as in *lepra*." (pp. 255, 56.)

CARMICHAEL mentions that he "knew a gentleman who was always attacked by this eruption when he took but a single grain of calomel, and also an instance of the disease being produced by the application of the black mercurial wash to a venereal ulcer." (p. 326).

"Although the *Eczema mercuriale* is produced by the action of mercury, yet the disease is not always exasperated by persisting in the use of it; for in some particular cases, 'where,' says PEARSON, 'I judged it to be of great moment to continue the mercurial frictions, the eruption neither spread universally, nor was it materially increased, although the patients were not relieved from it till mercury was discontinued.'" (p. 173).

(4) BACOT says:—"The character of the mercurial ulceration of the throat is that of an apthous superficial sore, surrounded with a general blush of inflammation. The tonsils are the usual seats of the ulceration, and they are sometimes also met with on the *velum pendulum palati*. Occasionally there is much stiffness and difficulty of swallowing, without the appearance of any breach of surface at all. Now, independently of the mere appearance of the sore, these symptoms will always be found in connexion with, or almost immediately following the use of the remedy—that is to say, that when towards the termination of a mercurial course, whether the effects of the mineral have been such as might have been wished for and expected or not, if the patient begins to complain of pain or difficulty in swallowing, and upon examination the tonsils are found either studded with small ulcers or affected with only one larger superficial sore, the patient being himself not quite free from fever, with disturbed rest and feelings of general discomfort, there can be no hesitation in believing that this disease is the result of mercurial action. The same symptoms making their approach within two or three weeks after the mercury has been discontinued, will also admit of the same explanation, and more especially if our patient, after having been confined to the house, or nearly so, during his cure, has been exposed to sudden or severe transitions of temperature." (pp. 265, 66.)]

860. The character of the mercurial disease is diminished cohesion and atony; it is a cachexy similar to the scorbutic. The means recommended for it are, leaving off the mercury, the employment of warm

and strengthening dietetic treatment, *sarsaparilla*, *saponaria*, *smilan chinæ*, *dulcamara*, *bardana*, *guiaiacum*, mineral acids in connexion with wood-drinks, the *tinct. arom. acida*,—*sulphurico-acida* in decoction of fine buds or malt; mild, strengthening, and astringent remedies, bark, cascarilla, *folia aurantiorum* and *fol. ilicis aquifolii* in decoction or infusion; subsequently, steel. In the mercurial disease, disturbance of the functions of the liver usually occurs, against which the laxative extracts, and especially the *extract. chelid. maj.*, recommended by the English practitioners, in connexion with soda and the like, are of considerable service (1).

For the local treatment, penciling the ulcers with muriatic acid, and gargles of hemlock and honey; in the eruptions on the skin, sometimes antimonial, sometimes *guiaicum* preparations, *liq. sapon. stibiati*, *tinct. guiaic. ammon.;* in pains of the bones, bark, opium, and aromatic baths, Struve's hunger-cure has been recommended as a most important remedy, as also the use of sulphur and ferruginous baths. If after the removal of this cachexy *syphilis* still exist, the red precipitate of mercury, with wood-drinks, is very efficient. Although it is characteristic of the mercurial disease, that it becomes worse under the use of mercury, and although this disease arises by the immoderate use of mercury, without *syphilis* being present, for instance, from the operation of mercurial vapour, and so on; yet, however, on the other hand, it is certain, that it frequently is only the consequence of immoderate and improper mercurial treatment, of a repeated suppression of the syphilitic disease, which however continues only under an altered form; a methodical suitable mercurial treatment is therefore capable of curing both the mercurial disease and the *syphilis*. From my own experience, I must give the preference to Zittmann's decoction before all other treatment (*a*).

Schmalz has, in electrifying patients, in whom it could not be made out, which was to be considered the consequences of *syphilis*, or which of the immoderate and improper use of mercury, observed salivation occur without further employment of mercury, and to such an extent, that severe mercurial fever and profuse sweating came on at the fifteenth day. He administered the electric *aura* to the patient either by a dome placed on his head, or put the chain into his hand, and continued the electric stream at first only for a quarter of an hour. Therewith also he gave water-gruel, with medicine twice a-day; took care to keep the bowels open, and to preserve the warm temperature of the chamber, which the patient was not allowed to leave (*b*).

[(1) "To prevent the dangerous consequences of this diseased state (*Erethismus mercurialis*) the patient ought to discontinue the use of the mercury," says John Pearson; "nor is this rule to be deviated from, whatever may be the stage, or extent, or violence of the venereal symptoms; the impending destruction of the patient forms an argument paramount to all others. * * * The patient must be expressly directed to expose himself freely to a dry and cool air, in such a manner as shall be attended with the least fatigue. It will not be sufficient to sit in a room with the windows open; he must be taken into a garden or a field, and live as much as possible in the open air until the beforementioned symptoms be considerably abated. The good effect of this mode of treatment, conjoined with a generous course of diet, will be soon manifested; and I have frequently seen patients so far recovered in the space of from ten to fourteen days, that they could safely resume the use of mercury, and, what may appear remarkable, they can very often employ that specific efficiently afterwards without suffering any inconvenience. * * * In

(*a*) Wedemeier, above cited.
(*b*) Frorief's Notizen, 1826, Oct., p. 207.—Hecken's lit. Annalen, Mai, 1827, p. 107.

the early stage the farther progress of mercurial *erethismus* may be frequently prevented by giving the camphor mixture, with large doses of volatile alkali, at the same time suspending the use of mercury." (p. 157–159.)

"As a general rule," in *Eczema mercuriale*, says PEARSON, "I would premise that the administration of mercury must be discontinued on the first appearance of the eruption. The *Eczema mercuriale* certainly admits of a natural cure, not only when it affects the body partially, but when it is universal; yet, although the troublesome symptoms which arise may be relieved by their proper remedies, I am doubtful whether any plan of treatment has the power of interrupting its regular course, or abridging its duration. I have been confirmed in this opinion of the inefficiency of any medical aid in curing the disease, in the proper sense of the term, by observing that under all the various modes of treatment which I employed, this disease, like some of the *exanthemata*, pursued its usual mode of progress, without undergoing any apparent change, either in the number of its essential symptoms, or in the comparative mildness and continuance of them." (pp. 176, 177.) PEARSON, however, thinks the patient may derive advantage from medical treatment, so that his general health should not suffer material or permanent injury; and recommends antimonial powder and saline draughts, or liquor of acetated ammonia at the onset, with gentle purging, and opium to allay irritation either with camphor or HOFFMANN's anodyne (*spir. æth. sulph. comp.*); and "when the discharge is no longer ichorous, and the tumefaction is subsiding, sarsaparilla with bark may be given liberally."

"The cure of the sore throat proceeding from constitutional irritation or cold taken upon mercury must," says BACOT, "be effected by purging, by antimonials, by an abstinent diet, as far as animal food and fermented liquors are concerned. * * * When all febrile heat is removed, the bark or sarsaparilla will be found of great efficacy in restoring the vigour of the constitution and expediting the healing of the sore." (p. 266.)]

The subjects *gummata* and nodes are considered under EXOSTOSES.

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A.—OF CARIES.

(*Caries*, Lat.; *Knochenfrass*, *Beinfaule*, Germ.; *Carie*, Fr.)

861. *Caries* consist in a diseased change of the substance of bone, analogous to ulcers in soft parts (1). If the diseased bone be bared of the soft parts covering it, it is found to be brownish, often blackish, its surface rough and uneven, yielding, worm-eaten and destroyed to a considerable extent; the bony layers are fragile, may be easily penetrated with a silver probe, and a grayish brownish or blackish *ichor* escapes, which gives out a filthy and peculiar smell; the bony layers are frequently loosened, and spongy or fleshy growths (*Caries fungosa*) spring up from the surface of the ulcer (2).

[(1) "The term *caries*," says Lawrence, "does not apply to all the circumstances under which ulceration of a bone takes place. When a portion of a bone dies, that part is separated from the sound portion by a process of ulceration; but that ulceration does not come under the denomination of *caries*. Ulceration of bone, in fact, like that of the soft parts, is various in its nature. There is a healthy ulceration in soft parts, enabling them to repair injuries, and there is a similar ulceration in bone. Now to that healing kind of ulceration we do not give the term *caries;* but we apply the term *caries* of the bone to an unhealthy species of ulceration, an ulceration which is not of a salutary but of a destructive nature. This kind of ulceration, like the morbid ulceration of soft parts, is preceded by inflammation; the bone first inflames and then ulcerates, just as you observe in the case of a sore leg, where the skin inflames first and then proceeds into a state of ulceration. This state, too, is accompanied by the formation of matter, in which respect *caries*, or the ulceration of a bone, is analogous to the same process in the soft structures of the body. Such then, is the sense in which we employ the term *caries;* it is a morbid ulceration of the bone, preceded by inflammation, and attended with some kind of suppuration or formation of matter." (p. 356.)

(2) As Miescher states, "Granulations are not entirely deficient, inasmuch as every bony surface, affected with *caries*, is covered with a certain soft substance, corresponding to the growing granulations in healthy suppuration; but they are of a bad kind, of livid colour, and when touched bleed easily; mostly they are scanty, but sometimes so luxuriate in a kind of fungus, that the roughness of the bone itself can be scarcely, or not at all, examined. Of whatever kind they be, they *never go on to scar*, but having been produced by humours, the commixture of which has been corrupted by general disease, and acquiring their life from that part of the body of which its own life has been altered by disease, they have an organic structure but little perfect, and only enjoy a short existence, in consequence of which they soon die, and together with them also larger or smaller particles of the bone itself. Under them new granulations sprout up, but unless the existing disease be got rid of, are not better than the former, and die also in a short time; and thus, with the *caries* always creeping further, the suppurative inflammation elsewhere of its own nature producing new substance, here seems to run on to nothing but a sort of destructive process. But nevertheless even in *caries* it appears nature provides, that new organic substance should be produced from the growing granulations, which although of scanty and of bad character, are never entirely deficient. Indeed this is often proved even by the formation of new bony substance; for dyscrasic inflammations as they are called, and especially the syphilitic, not unfrequently, from the very first, produce new formations, from which we know that *exostoses* are mostly first produced; but the very carious surface is sometimes studded with new bony, spiny, spongy fomentations, which as Clocquet observes, 'are analogous to the fungous flesh springing up in soft parts.' The surrounding *periosteum* is swollen, and

between it and the bone itself new bony matter is poured out, and often forms large *exostoses*." (p. 209–10.)

"The distinguishing character of *caries*," observes SYME, "is the same as that of cancerous ulcers in the soft parts, viz., obstinacy of action. * * * The disease has, for the most part, remissions more or less complete, and of considerable duration, in which the pain and discharge nearly or altogether cease and the ulcer seems to be on the point of healing, or actually becomes covered with a thin soft *cicatrix*. But these amendments are only partially and temporary, being always followed by relapse, and there is no natural limit to the duration of the disease, except the life of the patient, who, after months, or even many years of suffering, becomes finally exhausted, either by the *caries* itself or some other *dis*order which the irritation produced by the *caries* has excited." (p. 170.)

"The diseased part," observes MAYO, "often neither can recover itself, nor be absorbed; neither does it become necrosed. Left to itself, the *caries* would continue year after year, undermining the constitution of the patient, gradually invading the adjacent sound bone and finally threatening with destruction the neighbouring joint. It is often extremely difficult to tell whether an inflammatory enlargement of bone is abscess, or *caries*, or *necrosis*." (p. 38.)]

862. These changes of the bone are always dependent on previous inflammation, which has its seat either in the *periosteum* and outer layers of the bone, or in the medullary membrane, in the *parenchyma* of the bone. The formation of a bony ulcer is therefore always preceded by dull, deep-seated, frequently very severe, wide-spreading pain, the swelling, not very great but slow, over which the colour of the skin is not changed. After a shorter or longer time a swelling dependent on the collection of puriform fluid takes place, sometimes on the very seat of the diseased bone, sometimes at a distance from it, which, if the bone be covered with few soft parts, seems connected with it, and is surrounded at its base with a hard edge. If this swelling be opened, an ill-conditioned variously-coloured *ichor* is discharged, which sometimes has a very bad smell. If the destruction be great, hectic fever sometimes occurs. If the inflammation have begun in the interior of the bone, it is often thereby changed partially, or throughout its whole extent, into a spongy, wide-spreading mass accompanied with severe pains which increase especially as the patient warms in bed; the neighbouring soft parts are also much expanded, and finally fistulous sores arise (*Spina ventosa, Caries centralis, Pædarthroce*, Lat.; *Winddorn*, Germ.)

Besides these appearances the *diagnosis* is specially determined by examination with the probe, in which the bone is found rough and variously changed; further, by the peculiar form of the ulcerated openings in the soft parts, which have a shrivelled appearance, are contracted, and callous, or have their circumference surrounded with fungous excrescences. The silver probes employed in examining carious ulcers are frequently blackened; this, however, is no very definite sign, as it may be produced by any impure and ill-conditioned pus. The patient usually feels deep-seated pain.

["In considering the primary attack of bone by *caries*, the question," says MIESCHER, "arises, in what way is the bony substance in this disease destroyed? how is it that suppuration, naturally producing a new substance, should in this case deviate into a destructive process? Comparison of *caries* with ulcers in soft parts throws no light on the subject, nor is it more set forth in them, how organic substance is destroyed by ulceration. * * * Doubtless ulceration of bones or *caries*, is most suitable for clearing up this ambiguous question, because this tissue, abounding in earthy parts, even when deprived of life, for a long while resists chemical decomposition, and then may be distinguished in the pus or adhering to the very surface

of the ulcer. We see it asserted in the works of not few writers, that in a carious ulcer the pus may be perceived to be as it were sandy to the touch, and containing bony particles oftentimes pretty apparent, and that if a probe cannot be used to the affected bone, that this alone certainly indicates *caries*. But nothing final can be obtained on this very point, as no one speaks distinctly upon the question. For what HIMLY (*a*) contends for, that the surface of the bone always dies, is not sufficiently confirmed by argument. And the same may be observed as to BELL's statement, that in *caries* there is often no exfoliation; and who has even described that peculiar form of it which he calls phagedenic, which spreads most rapidly on every side, without any exfoliation, and merely by the violently excited action of the absorbent vessels." (p. 210–12). In the instances of *caries* in different bones examined by MIESCHER, he says:—"In all these, minute bony plates were discovered dead, and more or less separated; some entirely separated lay on the surface of the ulcer, and beneath them was a soft substance, consisting of numerous vessels, overspread with bone, as is constantly observed in a separated necrotic bone; some still adhered to this soft substance by some tougher filaments; in others the separation had proceeded less far, so that more or less still adhered to the bone itself. These dead plates were not only found on the external surface of the bone, but more frequently at that part where the ulcer penetrated more deeply, and their irregular surface appeared here and there covered with mucous dirty matter, which probably was produced by the decomposed soft substance. Elsewhere, this soft substance only was observed; in which places the dead parts seem to have flowed off with the *pus*. The whole surface therefore attacked with *caries* presented various stages of separation of the dead plates, by which the roughness felt with a probe, was easily explained as well as the corroded appearance of the softened bone, which although less conspicuous, is discovered after the separation of *large* pieces of bone." From the review of these circumstances and of those connected with simple suppuration of bone, MIESCHER concludes, that "the organic matter in *caries* is destroyed by *necrosis*, and that *caries* might very properly be named '*necrosis* in particles,' as the very able and experienced RUST had called it in his Lectures. It appears that dead and separated bony particles are not to be found in every carious ulcer; for when that destructive process exists, ulceration proceeds no further, but it is only occupied in secreting sanious pus and producing granulations of a bad character, the previously dead particles having separated, and been thrown out with the *pus*, and no more make their appearance. It is further to be observed, that it is of no consequence what dead parts are separated and what destroyed by *caries*, but that in the destruction of the organic tissue much is to be attributed to the more active absorption as fitted for separating the dead parts." (p. 212–13).

"When a carious bone has been macerated, the diseased part," remarks SYME, "is found excavated and rough, the cancellated structure being remarkably spicular, white and brittle, so as to resemble a spongy bone which has been exposed to the action of fire. The surface thus affected, is often of considerable extent, though frequently very small, even in cases of old standing; but the disease seldom reaches to a considerable depth. The field of the disease seems to be determined by the primary inflammation, and after being thus established, has little or no tendency to become larger. Around the carious part there is always an effusion of new osseous matter, in the form of warts or tubercles, extending to a considerable distance, and greatly increasing the thickness of the bone. This new mass, which is no doubt produced in consequence of the irritation of the disease, like that formed to re-unite fractures, and supply the place of exfoliations, is characterized by compactness and smoothness when minutely examined, though on superficial inspection it appears rough and porous. The pores are apertures for the transmission of blood vessels, but their form is circular, and their edges rounded off, so that sharp edges cannot any where be perceived. The newly effused bone may thus be readily distinguished from the diseased part, to the irritation of which it owes its origin." (p. 170–71)].

863. All injuries, producing inflammation of bone which ends in ulceration may be considered as causes of *caries* (1). They are either *external* or *internal;* to the former belong external hurts, kicks, blows,

(*a*) Ueber den Brand der harten und weichen Theile. Goet., 1800, p. 96.

wounds, tearing of the *periosteum*, fractured bones, continued pressure, suppuration in the neighbourhood of the bone; exposure of the latter, especially if the air be freely admitted or the treatment have been improper. The internal causes are especially, *scrofula*, *syphilis*, scurvy, rickets, gout, rheumatism, suppression of customary discharges, *metastasis* after previous active or chronic eruptions of the skin (2). Ordinarily from the external causes rather the superficial, and from the internal rather the *parenchyma* or internal substance of the bone is affected. *Caries* most commonly occurs in the soft spongy bones.

As regards the distinction of bony ulcers from suppurating wounds of bone, and the exposure of the bone, what has been already said (*par.* 746) of the distinction of ulcers, especially from abscesses, here applies.

Delpech (*a*) believes that the diseased changes which *syphilis* produces in bones does not deserve the name of *caries*, as therein the bones suffer little from change in their structure, but rather become necrotic. Although this is commonly the case, as already mentioned, (*par.* 823), yet is it, however an opinion, which cannot in general be assented to.

[(1) "In *caries*," says Mayo, "absorption is preceded by a change in the bone, which (with very few doubtful exceptions) has a well-marked inflammatory character. The same condition exists during the progress of the absorption. There is further present an imperfect restorative action, which is shown in the more or less partial growth of unwholesome granulations from the ulcerated surface. Of these changes, the inflamed condition of the bone is the primary and most important; the absorption is secondary and accidental." (p. 36).

(2) Miescher points out the seat of the various kinds of *caries* from internal causes as follows:—"*Scrofulous caries*, for the most part, attacks the spongy texture, as the bodies of the *vertebræ*, the carpal and tarsal bones, and the joint-ends of the long bones; beginning in the previously formed internal tubercles of which, it excites in them inflammation and swelling, and afterwards attacks the soft parts, which at the commencement of the disease, were almost, or entirely free from it. The scrofulous differs especially from *rheumatic caries*, which is also situated in the joint-ends, but arises from inflammation of the soft parts, the ligaments and synovial membrane, and thence sometimes seizes on the articular surface itself. The *arthritic* no less prefers the region of the joints, but attacks the external surface of the bone, having been mostly preceded by the formation of *exostoses*. In general, arthritic concretions are observed in its immediate neighbourhood. The *syphilitic caries* seems to be next to the scrofulous, most frequent, but contrariwise, almost only resides in the compact substance of the bone; and then the *scorbutic*. These are especially distinguished, in that for the most part, the former is accompanied with the formation of *exostoses*, and these *exostoses* are the seat of ulceration; whilst in the latter, but very rarely do *exostoses* appear." (p. 216)].

864. The *prognosis* depends on the constitution, age, and circumstances of the patient, on the causes which have produced the *caries*, and on its seat. The prognosis is most unsatisfactory in very great general and especially in scrofulous ailment, and if the *caries* exist in the neighbourhood of a joint. If the hectic fever have exhausted the powers of the patient, the removal of the limb is often the only remedy. But in many cases, especially in young persons who have reached the age of puberty, nature effects the cure by her own powers, and in the following manner:—the air being kept from the diseased bone by the contraction of the fungous edges of the aperture of the ulcer, it either dies completely and is thrown off with suppuration as a granular powder, or in flakes, or in its whole thickness (*Exfoliatio sensibilis*); or it is removed by absorption, (*Exfoliatio insensibilis*), whilst at the same time

(*a*) Chirurgie Clinique de Montpellier. Paris et Montpellier, 1823, p. 454.

granulations arise from the bone, the suppuration improves and diminishes, and the external ulcer gradually closes.

865. As regards the *treatment* of *caries*, its causes must be first counteracted; the suitable mode of cure must be directed against *scrofula*, *syphilis*, rickets, gout, and so on, and close attention must be paid to the state of the patient's powers which are to be supported by proper remedies, and especially by good nourishing diet, and by the enjoyment of good air.

866. The *local treatment* of the ulcers requires great cleanliness in dressing; the carious part must be defended from the approach of the air, and the free escape of the *ichor* must be provided for. To this end, if the situation of the ulcer in the soft parts do not permit the ready escape of the *ichor*, enlargement of the ulcerated opening is frequently needed. In other respects the local treatment agrees entirely with that generally applied to ulcers. The openings of the sores are to be covered superficially with lint, all stuffing and introduction of tents are to be avoided, moist warm applications of chamomile or other aromatic vegetables are to be used, rubbing in of volatile salves or spirituous fluids on the neighbouring parts, and the use of general or local aromatic baths. In inflammatory affections, leeches should be applied around; gray mercurial ointment rubbed in, and softening applications made. By this treatment it is expected that the vitality of the diseased bone may be changed, and that it should exfoliate imperceptibly or perceptibly; and in the latter case, provision must be made for the removal of the separated portion of bone. This mode of treatment is preferable to the use of injections of warm water, of slightly astringent decoctions, or aromatic vegetables, as chamomiles, oak, chestnut, or Peruvian bark, or green walnut shells; of dilute phosphoric acid, of a weak solution of sublimate, of lime-water, kreosote, and so on; or if the secretion of the *ichor* be copious and stinking, some slight aromatic remedy must be strewed in powder on the ulcers. But if the treatment mentioned be inefficient, the ulcers not being kept up by a general diseased cause, and the position of the carious bone permitting, the cure may be attempted by the removal of the carious part and the simple treatment of an exposed sound bone, by cutting into the *caries* of a rib, of the breast and collar bones, the skull and face bones, the bones of the *meta-carpus* and *-tarsus*, of the articular surfaces, if the *caries* be not very extensive. If the latter be the case with the bones of the limbs, and especially in the joints, and destruction is to be feared from hectic fever, amputation or exarticulation of the limb is the only remedy.

The numerous remedies proposed for *caries*, as *asafœtida*, phosphoric acid, *rubia tinctorum*, *semina phellandrii aquatici*, muriate of barytes and so on, are not sustained by experience. Rust (*a*) recommends pills of equal parts of *asafœtida*, phosphoric acid, and *rad. calam. arom.*, from six to ten portions, three times a-day, as especially effective, particularly if *scrofula* be the cause of the disease. The use of acrid remedies, as *tinct. euphorbii*, *aloes*, *myrrhæ*, the acrid ætherial oils, and the like for the purpose of bringing about a more complete death of the diseased bone, for which purpose also the actual cautery has been employed, are to be entirely discarded, as their effect is not restricted merely to the diseased bone, but may also extend to the underlying healthy bone; only in *caries fungosa*, has the actual cautery

(*a*) Handbuch der Chirurgie, vol. ii. p. 398.

often appeared advantageous. Fricke (*a*) considers the complete exposure of the diseased bone as the best mode of producing its quick exfoliation.

["The absorption may be prevented," says Mayo, "by subduing the inflammation; or may, having begun, be arrested, and the crop of unhealthy granulations converted into a healthy restorative growth, if the case is of such a nature as to allow of the suppression of the inflammatory or specific action." (p. 36).

"The treatment must, in the inflammatory stage of *caries*, be antiphlogistic," says Lawrence; "take blood from the part locally, and adopt other antiphlogistic measures, and after this, counter-irritation, by the application of tartar emetic ointment, moxa, and so on, in the neighbourhood of the diseased bone. When we come to the ulcerative stage of the affection, we must employ the counter-irritant plan. So far as local means go, perhaps, we have no more effective methods of producing it, than by counter-irritation, issues, and moxæ. Further, as a local means of treatment, we are recommended, when the carious affection occupies a small portion of bone within our reach, to denude the bone, and remove the diseased part by means of Hey's saw, or a stout pair of scissors, or pliers, or by any other mechanical means, to cut away that which is the seat of disease." (p. 359).

"The treatment of *caries*," says Syme, "is to be conducted on the same principle as that of cancer, and consists in the use of means which have the effect either of destroying the life of the morbid part, or of removing it at once from the system. There is this difference, however, that there being no malignant tendency to take on the same diseased action in the neighbouring parts, it is not necessary to remove any of them, except in order to gain access to the seat of the evil. Notwithstanding this favourable circumstance, it is found extremely difficult to eradicate the disease by depriving the part affected of its vitality. * * * The effect of all these applications, to wit, the concentrated mineral acids, nitrates of silver and mercury, red oxide of mercury, and the actual cautery, (with a view of killing the morbid part), however carefully employed, is very superficial, and it is extremely difficult, if not impossible, to ensure their operation on the whole surface of the diseased part. They therefore always require to be frequently repeated, and generally prove quite inadequate to destroy the disease, unless it is very limited and accessible; and it is even not improbable that some of them, as the actual cautery, may occasionally make the matter worse, and extend the disease to the neighbouring bone by exciting inflammation in it. For these reasons, excision ought to be preferred to caustics for removing the carious bone; and if the part affected be within reach, which can always be ascertained previous to commencing the operation, it may by this method, be surely and thoroughly eradicated at once. If the disease is superficial, and of small extent, it is easily scooped out with a gouge, the toughness and compactness of the sound bone distinguishing it from the morbid portion. If extensive and deep-seated, it is best removed by taking away the whole of the articulating extremities. When the situation of the *caries* prevents it from being cut out, amputation ought, if possible, to be performed; if this be impracticable, the disease will sooner or later, prove inevitably fatal." (p. 172)].

867. If from examination with the probe it appear, that the diseased bone is partially or completely loose, it must be seized with the forceps, and drawn out; for which purpose the ulcer in the soft parts oftentimes must be enlarged. Commonly after the removal of the bone, the part upon which it was situated is covered with granulations, which must be very carefully destroyed with stimulating remedies. In cases where a large piece of bone has been completely destroyed, but will not separate, its removal must be effected by taking hold with the forceps, and moving it backwards and forwards; or if this be insufficient, it must be assisted even with the trepan, or with the scraper, if the position of the diseased part permit.

(*a*) Fünfter Bericht über die Verwaltung des allgemeinen Krankenhauses zu Hamburg, 1832, p. 237.

B.—OF NECROSIS.

868. Its low degree of vitality, is the cause of bone easily dying, and *necrosis*, which is analogous to the gangrene of soft parts, occurs as a consequence of inflammation, suppuration, or of a considerable tearing of the *periosteum*. According as the *necrosis* occurs from inflammation and suppuration, or from destruction of the connexion of the nourishing vessels of the bone, it may be distinguished into *consecutive* and *primary*.

869. *Necrosis* takes place at every age, in every condition of life and in both sexes, although usually in childhood and at the period of manhood: it is most frequent in the compact part of tubular bones, in the shin-bone, thigh, lower jaw, collar-bone, upper arm-bone, splint-bone, spoke-bone, and cubit: rarely in their spongy extremities. It also frequently attacks the flat bones. *Necrosis* is situated sometimes in the external, sometimes in the internal layer of the bone, or attacks it throughout its whole bulk.

All ailments which destroy the nourishment of the bone by the *periosteum*, or by the medullary membrane are to be considered as causes of *necrosis*. They may be either *external*, as mechanical violence, tearing of the *periosteum*, exposure of the bone, particularly if it be long subjected to the influence of the air, or be treated with acrid irritating remedies, contusions, and so on: or *internal*, in which may be included all the dyscrasie diseases already mentioned (*par.* 863) from whence inflammation and death of bone arise. The external causes rather produce *necrosis* of the external layers of the bone, as the internal causes do internal *necrosis*. Oftentimes both causes operate together.

["If the *periosteum*, which, by its own vessels is in most intimate connexion with the vessels of the bone, be destroyed to any considerable extent, the external layer of the bone (not its whole thickness) dies," says Müller (*a*), "because the vessels of the outer layer are rendered useless by the destruction of the *periosteum*. If the medullary tissue alone be destroyed by inflammation, or artificially in an animal's bone which has been sawn through, the inner layer (not the whole thickness) of the bone dies, because the vessels of the inner layer of the bone are in the closest connexion with the medullary vessels. Now the process which ensues, in internal *necrosis*, in the still living external part of the bone, and in external *necrosis* in the still living internal part of the bone, is remarkable: it becomes inflamed to the extent of exudative effusion, as in an inflamed fractured bone, and subsequently the effused matter, as in that case, becomes organized and ossified. If the bone be injured externally and there be an outer *necrosis*, the exudation takes place within the cavity of a tubular bone, and the medullary cavity is thereby diminished. This callus on the interior of the cavity of a tubular bone strengthens its walls, of which the outer layer is dead. If, on the other hand, the *medulla* of a sawn-through tubular bone be destroyed, in consequence of which the inner layer dies, the exudation takes place on the outer surface, from the external still living layer of the bone. Most writers have not distinguished the swelling of an inflamed bone, called by Scarpa its *expansion* from the deposition of bone following the exudative condition in the former case into the medullary cavity, and in the latter on the external surface between the *periosteum* and the bone. The exudation is a process continuing only for a certain time, but the swelling continues during the whole period of the inflammation, and first appears distinct when the bone softens and becomes very vascular opposite the necrosed piece. This expansion of the inflamed and softened bone, in the *mammalia*, plays the principal part in the regeneration of the necrosed piece of

(*a*) Physiologie des Menschen, vol. i.

bone. At the part where the healthy external layer touches the internal necrotic, or where the sound internal layer touches the dead external, the still living inflamed bony layer is quite soft, red, and granulating, and in internal *necrosis* increases externally, whence, however, no new tube is formed around the internal necrotic layer, (*sequester*), but a strengthening of the outer layer, or beneath the external separated necrotic layer, a strengthening of the internal layer ensues, both externally as well as towards the medullary cavity. This swelling proceeds whilst the surface of the inflamed and softened bone begins to suppurate, either internally opposite the internal *necrosis*, or externally opposite the external *necrosis*. If the whole thickness of a bone be dead, no bone is regenerated; the *periosteum* has nothing to do with it; on the contrary, regeneration ordinarily takes place when merely the outer or inner layer is destroyed; here, however, no new bone is formed, but the dead portion of the tube in internal *necrosis* is only the inner layer of the tubular bone, and the new tube around the dead is only the strengthened and swollen outer layer of the tubular bone." (pp. 403, 404).

Of *necrosis* produced by irritation, two very remarkable instances may be here mentioned, Bromfield's (*a*) case, in which the pea of an issue slipping frequently out of its bed, was confined by "a compress with a shilling in it bound very tightly; this, by its pressure, soon destroyed the *periosteum*, and not long after made its way through the surface of the bone into its spongy parts. Though a deep bed was thus obtained for the pea, yet violent pain and great swelling of the knee ensued; by throwing out the pea and dressing the bone properly a large piece of the spongy substance came away and the sore healed." (p. 10.) In the case referred to by Lawrence, "the patient had received a slight injury over the *tibia*, the sore put on the appearance of sloughing *phagedæna* or gangrene, and the concentrated nitric acid was applied to it. It appears that the acid affected the *periosteum* of the bone, at the part to which it was applied, and inflammation and *necrosis* of the *tibia* were the consequence." (p. 361.)]

870. The inflammation preceding *necrosis* has either an acute or chronic course, and is accompanied with more or less severe symptoms. If the inflammation be seated within the bone, there is first produced violent deep-seated pain, not increased by motion nor pressure, and frequently accompanied with severe fever, and exhausting perspiration; a hard swelling appears, which gradually spreads, and over which the skin is neither tense nor red. After a longer or shorter time, according to the severity of the inflammation, abscesses form in different parts, which burst and discharge *pus*, without the swelling being diminished. These openings often correspond to the position of the diseased bone, often they form, especially if the bone be covered with much soft parts, fistulous passages, of which the external openings are surrounded with a wall of flesh, a line thick; some of them close and others again break out.

["When the ossific inflammation is not cured," says John Hunter, "suppuration takes place, first, on the surface of bones or on the *periosteum*; secondly, in the substance; thirdly, (p. 508), in the medullary parts. * * * The *first species*.—When inflammation attacks the surface of a bone, the first effects are adhesive; and when suppuration takes place, the *periosteum* is separated as far as the suppuration extends, making underneath a cavity for the matter. As the adhesive states take place some way round the abscess, there is in many cases a circle of adventitious bone formed in the *periosteum* round the abscess. * * * Often, from the separation of the *periosteum*, part of the bone dies, and must exfoliate. The *second species* is of greater consequence, as more of the bone becomes diseased. When inflammation attacks the substance of the bone, it is seldom that the whole diameter of the bone swells, generally only one side, where the suppuration is. This must at first be much confined, from the solid parts around, and ulcerative inflammation is obliged to take place early; and accordingly as in common abscesses, the ulceration goes on towards the soft parts, and until it arrives there it is impossible to tell

(*a*) Chirurgical Observations and Cases, vol. ii. London, 1773.

whether there is abscess in the bone or not. * * * The *third species*.—Inflammation in the medullary part is still more serious in its consequence than the last. The body of the bone thickens from the adhesive disposition, and also the ossific disposition takes place in some degree in the *periosteum* all round, so that the external parts are much increased in bulk: this only takes place in the bones of the extremities, where strength is necessary, and never in the scalp, &c. The ossific disposition in the medullary parts takes place at all points of the abscess, and by this the other part of the marrow is saved. When suppuration takes place, there being no vent obliges the ulcerative inflammation to take place. * * * In the two last mentioned we have often exfoliations, as well as in the first (species); but they are less favourable from their situation being different, and are called internal exfoliations." (pp. 513–15.)]

871. The *diagnosis* is more certain, if the piece of bone be apparent in the aperture of the ulcer and be black; but if it be white and dry, the previous symptoms and the duration of the disease must decide whether it be exposure or actual death of the bone. In all cases, examination with the probe or with the finger, if the size of the aperture will allow its introduction, with which the dead bone is sometimes felt to be moveable, affords sufficient information. If the previous symptoms have been slight, it is probable that the *necrosis* is superficial. This may be presumed with more certainty, if the earlier swelling have not spread to the whole extent of the bone and the pain be more superficial. The size of the dead piece of bone is determined by the extent of the swelling, and the distance of the orifices of the fistulous openings from each other. If there be several dead pieces of bone at the same time, they are felt on examination by the several apertures at different places, and a swelling answering to each of them is observed. The corresponding fistulous apertures also do not heal, although some pieces of bone have been removed; they often, however, do not heal after the complete removal of the dead pieces of bone, because they go very deeply, and considerable suppuration occurs. Ill-conditioned, stinking blackish *pus* is no certain sign of *necrosis;* on the contrary, the suppuration is mostly good, and only degenerates when the general health is disturbed.

Although *caries* and *necrosis* are alike in many symptoms, as in the two diseases similar causes give rise to both, as the bones are laid bare by the removal of the soft parts, and less or greater portion of the substance of the bone is lost and suppuration is present, yet they are distinguished by the following circumstances:—*Caries* occurs especially in bones of a spongy texture, *necrosis*, on the contrary, in bones of a closer character; in superficial *caries* the swelling has not at first so great extent as in bony gangrene; the swelling in *caries* mostly opens itself to a greater extent, fistulous passages often occur which become callous; in *necrosis* these openings have ordinarily a fleshy wall; in *caries* stinking *ichor* flows but in *necrosis* true pus, which is only bad when retained too long by improper treatment, or when the neighbourhood is much irritated, or when *caries* also exists; in *caries* there are vital appearances, injection of vessels, loosening up, suppuration and successive destruction, therefore is the touch of the probe painful, whilst the necrosed bone is insensible and pain is only produced by harsh touching, and which spreads to the sound parts; the softening which accompanies or precedes *caries* extends further and loses itself imperceptibly, and above all, where it exists the bony cells are filled with reddish fluid; in *necrosis* it is developed in sound parts, is less extensive, and produces only one layer of granulations, which are formed between the healthy and dead parts; the fungosities of a carious bone are softer, grayer, more discoloured than those above and below a piece of the necrosed bone, and the latter have more of the appearance of the granulations of as uppurating wound; in *caries* the bone is rough, uneven, soft, broken up, fungous, and the probe easily penetrates it; in *necrosis* the bone is even and hard, and though rough, not, however, yielding and soft; the bony splin-

ters thrown off are in *caries* small, dust-like, and destructible; in superficial *necrosis* they are layer-like, in deep *necrosis* large, firm, and of the natural condition of bone; the *periosteum* or medullary membrane is in *caries* usually much changed or destroyed, whilst the one or the other or even both in *necrosis* preserve their integrity, therefore nature does little in *caries;* in favourable cases the openings become callous, and similar changes are produced in the bony substance, or granulations arise from the bone which become connected with those from the soft parts but are rarely converted into bone and form only misshapen masses, whilst in *necrosis* a more or less complete reproduction of the destroyed bone is effected. The course of *necrosis* is mostly tedious, but often also quick and connected with active inflammation, which is rarely the case in *caries*. After opening the abscess, the pain in *necrosis* usually subsides, whilst in *caries* it mostly increases (*a*).

The notion that in *caries* the organic principle (bony gelatine) has entirely disappeared, and instead of it a peculiar fatty matter produced which fills the cells of the carious bone, whilst in *necrosis* the formative principle remains unchanged and its respective relations, that is as they are found in health, remain, (Delpech, Berard, Pouget and others,) is not confirmed by Mouret's experiments (*b*), as according to him the fatty matter in which every writer believed, is always found in recent *caries*, well distinguished from rancid fat by its smell, which may serve as its characteristic; but all the bones he examined have a fibrous jelly-like substance, and contain a proportionate quantity of saline substances, as in healthy bone; it is therefore impossible by the chemical characters indicated to distinguish *caries* from *necrosis*.

872. Nature endeavours to separate a piece of dead bone, usually called a *sequester*, from a healthy bone, by the process of absorption, which at the line of connexion between the dead and the healthy bone, produces a loss of substance (1). As long as the exfoliation goes on by absorption and granulation, the small fleshy wall surrounding the fistulous opening remains, according to Dzondi's observations, unchanged; but it shrivels as soon as that process is completed, and the separated piece is thrown off externally, at the same time the previously very small round hole becomes irregularly enlarged. After this separation of the *sequester*, its expulsion is possible, and usually happens without hindrance, excepting such as the soft parts offer, if the dead piece belong to the external surface of a flat or tubular bone. Compensation for the lost piece of bone is effected by nature in various ways. If the *necrosis* extend only to the external layer of the bone, whilst the internal remains alive, which happens only in slight injuries from mechanical influence, abscess and the like, the piece of bone, if the *periosteum* and soft parts remain uninjured, is enclosed in bone newly formed by the *periosteum* and is separated within by the granulations formed from the living layer. The piece of bone exhibits a rough surface, produced by absorption. If the *periosteum* and the soft parts be destroyed on the affected parts of the bone, and it is bared of soft parts, or entirely separated from them by blood, suppuration, and the like, the granulations arising from the compact bony mass can only effect imperfect compensation so that a depression or deficiency remains at the place of loss. Here the piece of dead bone keeps its smooth surface and its whole thickness. In every severe inflammatory irritation of the surface of the bone, there occurs a corresponding plastic activity in the medullary canal, and new bone is produced, which opposite the point of greatest irritation, fills up the medullary cavity, In internal *necrosis*, if the layer of bone concealed

(*a*) Richter, above cited, vol. viii. pt. i. p. 128.—Dictionnaire de Médecine et Chirurgie Prat., Article, *Ostéite*.

(*b*) Révue Médicale, 1835.

within the medullary canal die, the compensating substance is formed from the *periosteum*, and becomes one with the external layer of the cortical substance, which remains healthy, excepting that the latter swells and softens, and thus assists in repairing the loss. If the whole thickness of the bone die, new bone is formed by the *periosteum* around the old, and the latter is diminished by absorption, in consequence of these increased vascular action and sympathy with the *periosteum*, and thereby its bulk is lessened, in proportion as the formation of the new bone from the *periosteum* proceeds. If a portion of a tubular bone with the investing *periosteum* be destroyed and separated, the compensation results less from the opposite ends of the bone than from the soft parts. The granulations filling up the interspace gradually thicken to a cartilage-like mass, in which subsequently ossification follows. In the capsule which surrounds the sequester, openings (*cloacæ*) are produced, the origin of which is not yet sufficiently made out, of various form, size and number, which communicate with the fistulous passages in the soft parts.

The reproduction of the bone does not depend on the *periosteum*, but only on the softened and outstretched tissue, which naturally close set, forms the thick texture of the bony walls.

[(1) "*Necrosis* and *exfoliation* are not," justly observes LAWRENCE, "synonymous expressions. When a portion of bone has perished, has become mortified or gangrenous, it is separated by a natural process from the healthy portion of the bone; and that separation, under certain circumstances, is called *exfoliation;* so that exfoliation is consequent on the *necrosis;* that is, the necrosed or mortified or dead portion of bone exfoliates or separates. Exfoliation is, therefore, a subsequent process, consequent on the previous death or *necrosis* of the bone." (p. 360).

The term *exfoliation* commonly applied to the separating sloughs of bone, in consequence of their occasional leaf-like form, is not improperly objected to by WEINHOLD, who observes, that "as much more frequently the sloughs assume other and very different forms, it is evident that this designation is not quite fitting, but that it would be better to call it *separation*, by which would be more correctly expressed what was intended to be said." (p. 22).

At least as early as 1786–7 (*a*) JOHN HUNTER observed:—"We have many opinions of this process (exfoliation) from different authors, but all are very imperfect. The bone that separates cannot come away by rotting, for it is only dead, and not in the least putrefied. * * * When a piece of bone becomes absolutely dead it is then to the animal machine as any other extraneous body, and adheres only by the attraction of cohesion to the machine. The first business of the machine, therefore, is to get rid of this cohesion and discharge it. For effecting this separation there are several natural and successive operations. The first effect of the stimulus is on the *surface of the living bone*, which becomes inflamed; whether new vessels are formed, or the old ones become larger, is undetermined; but by injecting the surface of the part it appears evidently much more vascular than the other parts. The surrounding parts also inflame, as the *periosteum* and cellular membrane often take on ossific inflammation. This produces another process; first, absorption of the earthy matter, and all the surface between the living and dead parts of the bone become as soft as if steeped in acid, while the dead parts remains as hard as ever. To complete the separation the absorbents continue their office and absorb the living parts also, and the first process is in a small degree attended with the second. The operation of separation does not take place equally; it begins at the circumference, and continues on to the centre, and before the centre has begun the absorption of the earth the circumference has begun the second. This progressive process in the suppuration causes the exfoliation to be tedious, so that the centre is the last place that separates. In pretty broad exfoliations, long before the centre has gone through the operation, the living parts perform their office in producing granulations from the surface, and continue, in proportion to the waste, to fill up the space." Shortly after, in speak-

(*a*) The date of the copy of notes from which PALMER has published his edition of HUNTER's Lectures on the Principles of Surgery.

ing of the spicula which remains on the exfoliating ring of a trephine-hole in the skull, HUNTER also observes:—"It appears from this last supposed case that it is my opinion that the absorption is of the surface of the living bone, but I by no means wish to be understood that no absorption of the dead piece can take place; for, on the contrary, I believe that nature sometimes finds it necessary to the completion of her process; it generally takes place when the separation is slow and the granulating process is quick. This absorption of the dead bone takes place in the fangs of the shedding teeth." (pp. 525–27). This extract proves that JOHN HUNTER had taught the true nature of the exfoliating process at least six or seven years before the publication of WEIDMANN's work on *Necrosis*. And it is very remarkable how nearly the expression of WEIDMANN's opinion on this subject corresponds with HUNTER's. "The actual cause," says he, "of that separation consists in the removal of those adjacent and cohering particles between the living and dead part, in such way, however, that the greater portion is removed from the living and some from the dead part." (p. 25.)

"The first appearance of separation," says HUNTER, "is an alteration in the part round the exfoliating piece. This alteration is first a sponginess; next its becoming fuller of little holes; then a small groove is produced, a kind of worm-eaten canal about the thickness of a shilling, becoming gradually deeper and deeper, and the depth is irregular, according to the extent of the original cause. The small holes appear at first in the surrounding parts and these appear more vascular the more so the nearer the diseased bone. Sometimes parts become dead without any change of colour, dying almost suddenly, perhaps by exposure or a blow, and the surrounding parts become spongy; the dead portion then looks the soundest, but when killed by previous diseases it is black. After exfoliation the living surface still continues soft until bone is formed. If it be a cylindrical bone it has the appearance of a *fœtus's* bone deprived of its *epiphysis*; it is hollow, but fills like a growing bone, in every respect, by bony matter deposited." (p. 527).

The subject of exfoliation has been well gone into by MIESCHER, and it is interesting to observe how completely his experiments and observations confirm HUNTER's statements.

"For the first few days," says MIESCHER, "it is not possible to determine how far the *necrosis* extends; although the colour appears changed in the external surface, yet it so gradually subsides into the healthy colour of the bone, that it is impossible certainly to define the boundary between them. Gradually, however, there appears a certain thinning of the bony tissue, the medullary canalicules seem here and there enlarged, so that a sort of *diploë*, as it were, is produced, the cells of which are filled with a kind of soft reddish substance. The walls of the cells become daily thinner and thinner, till at length they entirely disappear, so that the living and dead bone are no longer connected by bony substance; the necrotic part now alone adheres by a few very delicate fibres to the soft substance I have mentioned, and is moveable, but at length these fibres either subside of their own accord, or are easily separated; which done, the exfoliation is completed, and the bone appears covered with a layer of that soft substance, or with granulations. These changes do not take place at the same time in the necrotic piece, but first at its external edge forming the so-called *groove*, and thence by little and little pass on towards the centre. Hence it appears that in the part where the dead and living bone touch, absorption of the bony substance is taking place, proceeding as it would seem from the medullary canalicules and thence gradually breaking up the cohesion between the dead and living bone, till at last it is completely destroyed. The gaps, moreover, as they are gradually formed, we perceive to be filled with soft substance, which, when the separation is perfected, covers the bone sometimes with a thicker, sometimes with a thinner layer, secretes pus, and rises into granulations. Many have considered this to be softened bone; but this doctrine agrees neither with the production nor structure of that substance, for following it out from its beginning, we find, as already noticed by that very able and diligent observer TROJA, first, a reddish matter, little tenacious, almost gelatinous; subsequently when it has become somewhat firmer we perceive, by the aid of the microscope, a structure similar to granulations, such as are on soft parts; not, indeed, like the cartilage of bones, which ought to be found, if this matter be taken for softened bony tissue, that is deprived of its earthy parts. Therefore is it believed to be recently formed, precisely as every kind of granulation; which opinion, its very nature, afterwards, especially favours. * * * What has

been here said in regard to superficial *necrosis* and the external powers, applies to every kind of *necrosis;* which from whatever cause arising whether it attack the external or internal surface of the bone, or its whole mass or only part, always presents in its exfoliation the same phenomena, and always when separated, leaves the surface of the bone covered with granulations and secreting pus. (pp. 200, 201.)

Upon the disputed question whether in the separation of a *necrotic* piece of bone there be any absorption of the dead portion, or whether the absorption be confined only to the living bone, MIESCHER declares himself a supporter of the latter opinion. "I have already observed," says he, "that at the same time the groove began to form around the *necrosis*, the thin edge of the bent plate was somewhat bent down by the just growing granulations and that it wasted in minute scales. I was able to follow this out, as it were, step by step, by observation in *necrosis* produced by baring the surface of bones in rabbits, cats, and in the calf, in which throughout the whole proceeding, the wound remained dry; the little scales, separated in the crust covering the lips of the external wound, could be most distinctly demonstrated; which crust having been cautiously removed, the very thin edge of the dead plate appeared as it were corroded, and a lancet being introduced beneath it, very readily fell into minute particles. Small particles, therefore, having separated, it seems, like scales the *necrotic* plate gradually diminished to sometimes more than half its size; nor was it doubtful, that in the cases mentioned by RUYSCH, LA PEYRONIE, and ROUHAULT, the dead piece of bone thus by degrees entirely disappeared. This *exfoliation in particles* might be more difficult to demonstrate in those cases in which the wound is constantly moist with pus and poultices, and the thin plate is as yet perhaps dead; but, when the other phenomena do not at all differ, and absorption by a *solid* lifeless body seems opposed to the very laws of physiology, and when there is no fluid, by the solvent power of which it can happen that the dissolved dead bone should be absorbed,—we cannot, even in these cases, though more doubtful, but think that the *exfoliation by particles*, or *insensible exfoliation* is performed. In addition to this, the acute TENON says, that in the experiments he performed on dogs, he always observed, that the granulations which sprung up from the bared surface of the bone, as soon as they made their appearance, were covered with a minute crust, which might justly be considered as bony scales separated and thrown off by the granulations. Every support is, therefore, torn away from the opinion of those who, in the separation of *necrosis* by absorption, consider that something is taken away even from the dead bone; and we can now certainly contend, that the *necrosis is separated by absorption occurring in the living parts alone;* which is of no little moment for rightly understanding the separation of bones destroyed by *necrosis*." (pp. 207–8.)

I cannot agree with MIESCHER that absorption takes place only in the living parts during the process of separating a *sequester*. HUNTER's opinion is certainly correct, "that nature sometimes finds it necessary to the completion of her process," that there should be some absorption of the dead bone and that "it generally takes place when the separation is slow, and the granulating process is quick." I think that absorption of both dead and living part of the bone occurs most commonly in all external exfoliations; but of its almost invariable occurrence in exfoliations of the bones of the head there can be no dispute; for not merely is the under surface of the exfoliated piece hollowed in correspondence with the granulations beneath, but it rarely happens that there are not two or three regular holes eaten completely through both tables of the bone, with fungous growths from the *dura mater* protruding in the latter case, or the granulations alone in the former.—J. F. S.]

The following is the account given by TROJA of the incipient production of new bone seven days after the shell of the shank-bone of a pigeon had been killed by sawing the bone through and breaking up its medullary structure with a probe. "Having killed the pigeon on the seventh day, I was astonished, on removing the muscles, to observe the very great thickness of the shank-bone, which in comparison with the opposite healthy bone was enormously thickened. On examination I found fresh bone newly produced around the shank-bone. On separating the *periosteum*, which was every where a little swollen, except at the lower end, where it was swelled up with a dense or semi-cartilaginous jelly, blood-vessels were evidently perceived entering into the substance of the new bone. When I divided this bone lengthways into two parts, the new bone, now divided, dropped, almost of its own accord, into two equal portions, from both sides of the old shank-bone. Surprised

at the speedy separation of the new from the old bone, I endeavoured to ascertain the cause. Therefore carefully viewing the internal surface, I perceived a certain softer substance, and by bringing the point of my knife to the side of the bone, the membrane seemed to me to be lifted up. Struck with the novelty, I gave my attention to it; I inverted a true, entire, very juicy and thickish membrane. Whilst this was separated from the bone, which was very easily done, an almost infinite number of very delicate membranous threads were seen to draw out, which proceeding from the little apertures spread over the inner surface of the bone, were inserted into the membrane itself. Its ground colour was white, and transparent when raised against the light, but it was tinged and almost covered with very numerous red streaks, or, if you please, with an almost infinite number of spots collected together, but much less numerous at the lower end of the bone, which was also white. It well resisted pulling, nor did it dissolve, nor loose the characters of membrane when strongly rubbed with the fingers; but it was not to be considered as strong as *periosteum;* for as yet it had less cohesion. The substance of the new bone seemed spongy, and tinged every where with the red colour of the blood, except the lower end, which, as already said, was rather whitish and softer. When this substance was cut out and its thickness pressed with the fingers, a few drops of blood and lymph, like a scanty dew, exuded. (pp. 21–24). Its internal surface was furnished with an infinity of little holes, as well as the external; nor was the hole in the middle and outer side of the shank-bone for the passage of the vessels deficient. There were also some very large holes, which penetrating from the external to the internal surface of the bone, were covered without by the external *periosteum*, and within with the internal membrane; they contained a dusky whitish and dry crust; whence it was very clear that they originated in a defect of the ossification. I shall name them *foramina*, or *grandia foramina*." (pp. 27, 8). Weinhold says, that these holes, "as they give passage to the escaping pus and the loose pieces of bone, would be better called *cloacæ*." (p. 35). "Beginning from the sixth hour and going on to the seventh day," says Troja, "I did not perceive in the new bone, these spaces and *grandia foramina*, except when the legs were swollen, and then they were constant. In the twice that I proceeded to the seventh day, I did not make out whence were these spaces and *foramina*. At first I thought they were the insertions of muscles; but their irregular situation and uncertain number, one, two, and even to eight, and more careful examination, proved to me that such was not the case. Their absence in legs which had not swelled, and the *periosteum* raised from the bone in vesicles, assured me that no jelly could be collected in the spaces, and that the *foramina* in the bone must be produced by want of substance or of ossification. But it might be conjectured that the dry crust in them originated in the juice which the broken vessels poured out, drying on the surface of the torn *periosteum*, and perhaps from some layer of it which was dead." (pp. 58, 9). Weinhold says he has "seen a small portion of dead *diploë* of the *os innominatum* contained in a bony cavity without any *cloaca*. If there be many cavities in the same bone containing *sequestres*, each has at least its own *cloaca*. * * * Their form is round or oval, or somewhat like; their size is commonly sufficient to admit a quill; there are however some larger, though rarely so. Inwardly their edges are converging, and as it were contracted like a funnel, but outwardly their lips spread downwards, and their intermediate passage is sometimes long, sometimes short, and sometimes scarcely existing," (p. 35).

Upon the disputed point, whether the newly formed bone enclosing the *sequester*, in internal *necrosis*, be produced by the swelling of the outer layer of the bone, or from the investing *periosteum*. Müller observes:—"It is not in itself conceivable, that a membrane like the *periosteum*, which is merely the vehicle for the vessels entering into the bone, and also its covering, should form an organized mass of bone. (p. 405). It is a most entire misconception, to suppose that one organic part can be the nourishing organ of another organized part, for instance, that bony substance should be produced by *periosteum*, and that bone should be nourished by that membrane. * * * Bone is nourished by vessels from the *periosteum* and medullary membrane; it therefore dies if either of these be destroyed to some extent, the external layer on the destruction of the *periosteum*, and the internal on that of the medullary membrane. But it does not follow that these membranes deposit the lime in bone. The *periosteum* is the vehicle of the vessels penetrating the bone, which therefore dies when they are torn through at that part. The nourishment and

growth of bone depends on the sympathy of the bony particles between the capillary vessels and the blood. (p. 361). But it can be distinctly shown by experiments on beasts, (which for this purpose are better than birds), that the formation of the new tube is partly effected by the exudation, during the exudative stage upon the surface of the bone, which is to be viewed as exudation from the inflamed bone, and not from the *periosteum*, but that the greater part of the bony mass is alone formed (in internal *necrosis*) by the spongy swelling of the external layer which continues during the whole period of suppuration." (p. 405).

Lawrie of Glasgow (*a*) in treating on the subject of *necrosis*, asks:—"What part does the dead bone play in this process? does it act as a stimulant to the deposit of ossific matter? does it serve as a mould for the new bone? if it were removed, would the process be arrested? To all of these questions I would reply in the negative. I do not think that the presence of dead bone is more required to assist in any of the processes involved in the above queries than the presence of a slough of the soft parts in the generation of new flexible tissues. When the entire thickness of a cylindrical bone dies, the first step towards regeneration consists in an attempt to get rid of the dead part, by the absorbents forming a groove around the dead portion, gradually cutting it through and isolating it from the living. The next step, to a certain extent contemporaneous with the first, is the deposit of new osseous matter all around this groove, springing from the bone; the last, is the surrounding of the old bone with new, which begins to form before the old has separated, and continues after the connexion of the two has been quite dissolved. Currie's case (one he relates) appears to me to entitle us to answer the second and third queries in the negative; the old bone was removed long before the new was deposited; the process so far from being therefore arrested, was greatly accelerated, and the form of the new bone was much more symmetrical than if it had been deposited slowly around the old as a mould. It may be asked, if this view of the matter be correct, why is it not thrown off as a slough of the cellular tissue? I believe that the impediments to its escape are mechanical and not physiological (physical?); the soft parts which cover it, the irregular line in which it dies, and the vitality of the cancellous structure next to the *epiphysis* extending for some distance within the dead outer case, render its escape impossible long after its presence has become a source of retarding, it may be, of fatal irritation." (p. 684).

"So soon as any bony part, in which there has been previous sensible or insensible exfoliation, is covered with granulations, the process," says Miescher, "is the same as with another suppurating wound: the same *pus*, the same granulations. These having attained the height of the granulations of the surrounding soft parts, coalesce with them and as it were become one; after which the scar is covered in the ordinary way. That part of the granulations immediately next the bone, is converted into bony substance; but the exterior layer is not so changed, but like the granulations of soft parts has a cellular structure, and thus as it were forms a new *periosteum*." (p. 208.)

John Hunter observes:—"There can only be two species of exfoliation, *viz.* external and internal, but they are often mixed, and then admit of a third kind, which I call the enclosed exfoliation. The *external* arises from internal causes, and is in many parts a simple operation, meeting with no obstructions, as in the head, ribs, &c.; but in the extremities it is often complicated, and becomes enclosed, and then appears as an internal exfoliation. *Internal Exfoliation.*—These less frequently arise from accidents than the former; but may arise from the last two suppurations of bones (of which, the one is where only one side of the bone suppurates, and the other where the suppuration is in the medullary cavity.) The part which is to be exfoliated loses its life, and ulceration goes on in the internal surface of the surrounding living bone to make room for the exfoliation. In internal exfoliations a part of the centre of the bone becomes dead, while the enlargement of the cavity lessens the substance of the surrounding part, and consequently weakens that part. But nature wishes to furnish a substitute; for the stimulus of weakness being felt, the surrounding parts become affected, and undergo the ossific inflammation by which the bone is thickened; and this continues in proportion, and as long as the internal part is unremoved or not cast off. *Mixed Cases of Exfoliation.*—The first

(*a*) Cases of Necrosis, with remarks; in London and Edinburgh Monthly Journal of Medical Science, vol. iii. 1843.

is when an external one appears to be internal; the second is an exfoliation of the whole thickness of the bone in one part; the third, of the whole bone. These I call enclosed or encased exfoliations, generally occurring in the lower extremities. These three being very different, at first are not very easily conceived. *First species of enclosed.* Sometimes when the surface of a bone becomes dead, before the separation of the piece of bone takes place, the ossific inflammation comes on, and entirely covers the exfoliating piece, leaving only a little hole for the discharge of matter. This takes place, first, when the *periosteum* is inflamed, and the granulations from the edges of the exfoliated pieces also ossify; but the process for freeing the portion of bone has been already described. The *second species* is when a piece of any given length becomes dead throughout; the appearance of internal exfoliation is here still stronger than in the last case. Exfoliation or separation begins on the living surfaces of contact, at the two ends of the dead bone or piece, and ossific inflammation comes on in the surrounding parts, so that it becomes encased. This rarely happens; but when it does, the separation of the exfoliated piece is very tedious, as the stimulus is given to all surrounding parts. The *third species* is where the ossific disposition takes place in the soft parts, from end to end, and the whole becomes enclosed in a case of bone. The difficulty lies in conceiving how it becomes enclosed at the ends where the joints are constituted; but probably it is from these ends being alive, and exuding coagulable lymph from their surfaces, or else from lymph being exuded from the surrounding ligaments, and that becoming a basis, so as to keep the joint complete." (pp. 529, 30.)]

Upon the reproduction of bone, the following notices are to be especially compared:—

Troja, M., De novorum ossium, in integris aut maximis ob morbos deperditionibus regeneratione experimenta, &c. 12mo. Lut. Par., 1775.

Blumenbach, in Richter's Chirurgischer Bibliothek, vol. iv. p. 107.

Köhler, Experimenta circa regenerationem ossium. Gottingæ, 1786.

Weidmann, Above cited.

Boyer, Traité des Maladies Chirurgicales, &c., vol. iii. 8vo. Paris, 1822–26.

Meding, Dissert. de regeneratione ossium per experimenta illustrata; cum tab. æneis. Lipsiæ, 1823.

Kortum, Dissert. proponens experimenta et observations circa regenerationem ossium; cum tab. æn. Berol., 1824.

Richter, Above cited.

Scarpa, De anatome et pathologia ossium. Ticini, 1827.

Miescher, Above cited.

873. *Necrosis* is always a serious disease, of which the duration is indefinite. The *prognosis* is, however, various, according to its cause and its seat. Its cure may be hoped for by the natural powers alone, or by simultaneous artificial assistance, if the *necrosis* be superficial, of no great extent, in no bone of important function, not in the neighbourhood of important parts, produced by external causes, and when the patient's general health is good. On the contrary, the cure is difficult, and the *prognosis* is doubtful, if the *necrosis* be of great extent, connected with other affections of the same, or of other bones, if the diseased bone be of great importance, if the *necrosis* be internal or exist in several places; further, if it be produced by internal causes, especially those dyscrasic diseases, against which we have not any decidedly efficient remedy, and if the patient be old and very weak. *Necrosis* rarely extends into joints, but then always require amputation (1). The circumstances which especially produce *sequestres* are different; the granulations arising from the interior of the capsule enclose the *sequester*, which is gradually but completely removed by absorption; or it acts upon the walls of its cavity like a foreign body, and keeps up in it and in the neighbouring soft parts a copious suppuration, which debilitates the patient; or the *sequester* lies in a very spacious cavity, the walls of which

have already become callous, and produces no neighbouring irritation, but only a scanty pouring out of a thin purulent fluid (2).

[(1) Of *necrosis* indirectly affecting joints, and in which from the symptoms it was presumed that the joint was diseased, and the limb consequently removed, I have known two instances, both of which are in the museum at St. Thomas's Hospital. In the one, a boy of ten or twelve years old, the necrosed piece, about the size of a marble, was contained in the epiphysal head of the shin-bone; in the other the dead bone was nearly similarly placed, and the *cloaca* from it, had opened into the knee-joint.

(2) Other, and very dangerous consequences may attend *necrosis*, as the very remarkable case mentioned by Porter (*a*), which he calls "*Aneurism* in a case of *necrosis*," but which was doubtless no other, than a wound of the popliteal artery, by the accidental movement of the point of a *sequester*. The patient had, fourteen or fifteen years previously, violent pain in the left knee, which, as well as the lower part of the thigh, shortly after swelled to a great size, but without redness. A year after, a small swelling appeared four or five inches above the inside of the knee, which he himself opened and voided some matter, and the aperture remained fistulous. In August 1832 he had an alarming hæmorrhage from this fistulous opening, but no recurrence of it till the night of Jan. 1, 1833, when he bled with great violence, the blood at intervals spirting forth to a considerable distance, at others trickling down the limb, but in neither case restrainable. He lost great quantities of blood, and fainted seven or eight times. When admitted on the following day his face was quite blanched and very anxious; he was extremely exhausted; pulse small, thrilling, and 150. On pressing the small livid fistulous opening in the thigh, thin serous blood slowly discharged, and the finger seemed to sink into a deep cavity; pulsation was quite distinct in the swelling; the lower part of the thigh-bone was enlarged, and the popliteal space filled up, but the artery was felt pulsating below. Amputation was proposed, but he would not consent. The thigh continued swelling above the bandage, became gangrenous nearly up to the buttock, and he died on the evening of the 6th of January. On *examination* the popliteal space was found filled with thick grumous clots; on the artery, just below its entrance into the space, was an opening. The lower part of the thigh-bone was considerably enlarged, rough, and a large portion of its posterior or popliteal aspect destroyed, so as to admit the fingers into a large cavity within. In the upper part of this cavity was discovered the sharp point of a *sequester*, movcable, and accurately corresponding to the aperture in the artery, which it evidently seemed to have occasioned.]

874. In the *treatment* of *necrosis*, nature must be assisted in throwing off the *sequester*, which is then to be removed. If at the first there be severe pain, inflammation and fever, it must be attempted to lessen them by general and local blood-letting, according to the strength of the patient, by softening poultices and the like. If *syphilis*, gout or other dyscrasic diseases be connected with *necrosis*, the contraindicated remedies must be made use of. Where the general condition of the patient is good, and the *necrosis* originating from external causes, the separation of the *sequester* usually occurs soon, provided nature have not been disturbed by improper treatment. If the patient be well, his powers must be supported by good nourishing diet and strengthening remedies. The *local treatment* must be quite mild; moist, warm, slightly aromatic applications should be used, as in *caries*, and the fistulous openings covered with charpie, soaked in mild ointments.

All irritating treatment to promote the throwing off of the *sequester*, as the enlargement of the fistulous apertures, the application of sharp spirituous remedies, the actual cautery, the repeated boring of the dead piece of bone, are hurtful, inasmuch

(*a*) Surgical Report of Cases treated in the Meath Hospital; in Doublin Journal of Medical and Chemical Science, vol. v. p. 190. 1834.

as by their effect on the living part they increase the destruction, but on the dead bone have no effect at all (*a*).

875. When the *sequester* has separated, which is known, on examination, by its mobility, it is not unfrequently thrown out by nature, or gradually removed by absorption. But if, on account of its peculiar position, on account of the surrounding soft parts, or of the bony capsule enclosing it, this be not possible, the *sequester* must be removed by art. For which purpose, oftentimes a simple incision of the soft parts of sufficient size is alone needed; if the *sequester* be enclosed in a bony capsule, after exposing it by a longitudinal incision, the apertures must be enlarged with a bistoury, if the bone be soft enough; boring the capsule with the trepan, or the removal of a portion with chisel and hammer, or with HEY'S saw, may be required. The *sequester* is then to be seized with the forceps, or with the fingers, and gently drawn out, especial care being taken that none of it be left behind, and that the inner wall of the bony capsule be not injured. If the *sequester* be so large that a considerable opening is required for its removal, it is often better to break it to pieces with the forceps, so as to be able to remove it by a small opening. After its removal, the wound is to be lightly filled with charpie, every thing removed which can disturb the development of the granulations, and care taken for the sufficient outlet of the *pus*.

876. If the *necrosis* have been of long continuance, if the outflow from the fistulous openings be slight, if the *sequester* cannot be felt, if already several pieces of bone have been separated, the *diagnosis* is doubtful, whether there still exists a *sequester*, or whether it be not already removed by absorption. In this case the laying bare or boring through the bone is useless, and it is advisable to watch the state of things for some time, with simple treatment, in order to decide with certainty upon the diagnosis.

877. Amputation is only indicated in *necrosis*, when the cavity in which the *sequester* lies communicates with a neighbouring joint when there are several *sequestres*, of which each has its proper cavity, when the *sequester* lies so deep that its removal is not possible, and when the patient's powers are so sunk that throwing off the *sequester* cannot be expected, or its removal cannot be undertaken without the probable danger of exhausting the patient.

A.—OF CARIES OF THE SKULL-BONES.

878. *Caries* may occur in all parts of the skull, though it is most commonly observed in the mastoid process and in the occipital bone. It occurs either on the external or internal table of the skull; in the former case it arises either from external violence, exposure of bone, and so on; or as consequence of a *tophus*, or of an *exostosis* which has run into suppuration. The *caries* may be also distinguished by examination. In the second case severe symptoms are sometimes produced by the collection of pus between the *dura mater* and the skull. The patient complains of a constant pain, always confined to the same spot, though externally nothing is apparent. Frequently giddiness, convulsions and

(*a*) WIEDMANN, P., above cited.

coma; in short, all the symptoms of pressure on the brain come on. At last there appears externally, at the part where the patient has complained of pain, a slightly painful, and from the first fluctuating swelling. If this break of itself or be opened, an aperture is found in the skull, of which the edge is thin and irregular, because the destruction of the internal extends further than that of the external table of the skull, out of which by the motions of the brain, a more considerable quantity of pus is driven up than from the external extent of the ulceration would be thought possible. The *dura mater* is covered with discoloured granulations, often depressed, and separated to a greater or less extent from the skull, often even ulcerated. If the *caries* be in the mastoid process, hearing is almost always destroyed; in consequence of the communication of the cells of this process with the ear-drum, the *pus* sinks into it, and produces suppuration and destruction of the drum-membrane.

[The consequences of *caries* or *necrosis* in the mastoid process are very often fatal, and therefore the disease should be most carfully attended to. Most commonly it seems to begin with common ear-ache; abscess of the drum ensues; its lining is destroyed, and the bone either ulcerates and is gradually destroyed, towards the cavity of the skull, or dies outright and attempts are made to throw it off. I do not know any mode of distinguishing between simple chronic suppuration of the ear-drum which is occasionally accompanied with pain, and the suppuration accompanying *caries* or exfoliation; nor is there any distinction between the latter two, from either of which, however, the irritation set up on the *dura mater* may produce inflammation, ulceration and suppuration of that membrane, which consequently attack the brain, and either ulcerates its surface or produce, by remote sympathy, abscess in its substance, of which I have seen instances; and in the last case I had of this kind, the abscess was as large as a pigeon's egg, but the young woman had no symptoms of compression till about three or four days before she died, though at intervals, for some time before, she had suffered agonizing headach in paroxysms of several hours.

When the vault of the skull is attacked with *necrosis*, not unfrequently very large portions of bone die, as does also the scalp covering it, excepting at the circumference of the dead bone, which the skin still overlaps and seems as it were folded in. When both tables of the bone die, which, as far as I have had opportunity of observing is most common, though not to equal extent, as in general the external table is more largely destroyed than the internal, suppuration begins between the bone and the *dura mater*, and if near a suture, the pus makes way between its teeth and is seen welling up at every pulsation of the brain. By degrees the granulations formed on the surface of the *dura mater* eat away holes of various size *through* the dead bone, and funguses appear, which, however, rarely exceed externally the size of the aperture. But on removing the dead bone, very large funguses are found on the *dura mater*, and in the course of a few hours, when freed from the pressure, rise above the surface of the scalp, sometimes to the size of half a split egg. These funguses are generally very foul, sloughy, blackish, green-coloured and horribly offensive; and when of large size the patient generally sinks with symptoms of inflamed brain. Instances do, however, happen in which enormous portions of the vault of the skull do separate, and the patient recover; I have at this time under my care a woman, who in the course of the last eight or nine years has lost by exfoliation, the greater part of both parietal bones, and some portions of the temporal and occipital. All one side of her face supplied by the facial nerve, (*portio dura*), has been paralyzed for many years, though it cannot be ascertained how this is connected with the *necrosis* during the course of which it has arisen. Other portions of the skull have from time to time exfoliated, but after the principal exfoliations, the deficient parts of the skull have filled, as usual, with tough fibrous membrane, and she has been able for four or five years to follow her ordinary occupation as one of the hospital servants. If the external table only have been destroyed, the bony granulations beneath as frequently make holes through it as those from the *dura mater* do through both tables.

Caries occurs also in the bones of the face as well as of the skull, and more especially of the nose-bones, where it is very frequently consequent on lupoid ulceration of the soft parts. I have also at present under my care a boy in whom the upper jaw-bone has been destroying slowly for the last four years from this same cause, and who has lost the greater part of the front of the alveolar arch and of the bony plate, nor has any remedy arrested the diseased process but for a very short time, after which it has burst out again with greater activity.

The disease which results from mercury is *necrosis*, rather than *caries*, whether happening either on the skull or face; and even in *syphilis* except when the bone is affected secondly by the extension of the ulcerative process from a sore in the soft parts, *necrosis* is more frequent than *caries*. Syme (*a*) relates the case of a woman who at the age of twenty years had a sore on her nose, for which she took large quantities of mercury. The sore rapidly extended, the bones became affected, and a rapid exfoliation commenced, which soon deprived her of all the face except the lower jaw and part of the *ossa malarum*. Five years after her eyes were divested of their coverings, the *pharynx* completely exposed to view, the tongue lay exposed from root to apex surrounded by the foul and vacillating teeth of the lower jaw, and the whole surface had a most unhealthy ulcerated appearance. In the course of the following four years the whole ulcerated surface had healed, and the eyes were covered with a thick skin. She was very weak and for a long period had existed on little else than laudanum, of which she took half an ounce daily. She died shortly after, and on examination it was ascertained that the remaining bone was every where perfectly sound. (p. 238).—J. F. S.]

879. What relates to the causes of *caries* of the skull-bones has been already said on the general subject; it is, however, most frequently consequent on syphilis. The *prognosis* is determined according to the variety of the causes as well as the extent of the *caries*. If it occur on the inner table of the skull, or if the skull be eaten through from without to within, pressure on the brain or ulceration of its membranes, which often extends to the brain itself, is to be feared.

880. The *treatment* of this *caries* is guided by the general rules. Only when both plates of the skull are destroyed, especially if the *caries* have been developed on the internal, trepanning is often necessary in order to relieve the collection of *pus* beneath the skull, or even to remove the whole diseased part of the bone. In *caries* of the mastoid process especial care must be taken for the proper escape of the *pus*, so that it should not collect in the drum. If the *dura mater* itself be ulcerated or covered with unhealthy granulations, it must be bound up with slightly stimulating remedies, with decoction of bark and lime water, with digestive ointments and the like, and the vital activity assisted by aromatic applications.

B.—OF CARIES OF THE TEETH.

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(*a*) Edinburgh Medical and Surgical Journal, vol. xxxii., 1829.

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881. The teeth belong to the bony system, and therefore analogous diseased appearances are observed in them. *Caries* occurs in all the teeth, though more frequently in the molar than in the incisive teeth. Most commonly it begins in the crown, but not unfrequently also at the root of the tooth.

882. *Caries* is developed at the crown of the tooth, either from *without inwards*, or from *within outwards*. In the former, the enamel of the tooth is observed to lose its natural white colour and polish at one or more parts, either on the sides, or upon the top of the crown; clefts and hollows are seen which have a brown or blackish appearance, and gradually enlarge. The affected tooth gives out a nasty smell, and if the destruction penetrate to the inner substance so that the nerve be exposed to the contact of the air and food, pain of varying severity and duration occurs, frequently also inflammation of the gums and the like. In the second case, no change is in the begining, observable on the crown of the tooth, but pain first occurs, is more or less severe and of indefinite continuance, though always soon returning, as often as it is suddenly excited by cold air, cold drinks, and the like. At last, on examining the tooth, a brownish or blackish spot, more or less deep, is observed in the enamel, which gradually enlarges, becomes darker, and destroys the enamel, when the internal substance of the tooth is found to be decayed, so that enamel is often merely a thin shell which is easily broken.

When the crown is destroyed by *caries*, it spreads also to the root of the tooth, which is likewise destroyed, and then commonly the gums and alveolar process suffer. The gum surrounding the diseased root,

puffs up and inflames, (*Parulis*,) and not unfrequently an abscess is formed. Oftentimes the membrane lining the tooth-socket also inflames, *pus* wells up between the gum and the tooth-fang, frequently very severe pain occurs which spreads over the entire half of the face, and is accompanied with swelling of the cheek.

[Occasionally it happens, that without any *caries* of the tooth, irritation is set up in its socket, and when the jaws are firmly closed the pressure of the tooth into the particular socket causes severe pain. In a very few hours the lining of the socket begins to swell and inflame, lifts the tooth much above its proper level, and consequently renders the closing of the jaws still more painful, and chewing the food almost agonizing. This continues for hours, and sometimes for two or three days, when suppuration commences, the pain and swelling subside, and the tooth again descends to its natural place. This unpleasant process is of very frequent recurrence, gradually separates the gum from the fang till the two are quite apart, and the tooth seems held merely by the vascular and nervous connexion of the ends of its fangs, when its looseness and the constant source of irritation it becomes, leads to the tooth being pulled out. Under these circumstances I have unfortunately had personal experience, that the fang is encrusted with a granular deposit seemingly bony. Leeching the neighbouring gum is all that can be done; but when the process has been once set up, it recurs again and again, till the connexions of the tooth and gum are entirely destroyed, although the tooth itself remains entirely free from caries.—J. F. S.]

883. *Caries* at the root of the tooth is often announced, for a long while, by very equivocal symptoms. Pain occurs in the tooth, but rarely of long continuance, inflammation and swelling of the gums about the diseased tooth, which frequently becomes very severe, abscesses in the gums, outside the mouth, upon the cheek, at the part corresponding to the root of the affected tooth (*Tooth-fistula.*) The crown is, under these circumstances, often still completely healthy, and the *diagnosis* can only be properly determined by particular observation of the symptoms mentioned and by the circumstance of the tooth smarting when touched with a metal probe.

884. Besides these symptoms caused by carious teeth, there occur not unfrequently, *caries* of the alveolar processes, diseased changes of the Highmorean cavern, if the tooth be in the upper jaw (1), as well as swellings and excrescences upon the gums, (*Epulis*,) which are of different kinds, sometimes soft and spongy, sometimes firm and hard, sometimes slightly or not at all, but at others severely painful; sometimes they have a broad, sometimes a pedicled base, and various size, but always red, and they are situated more commonly on the under than on the upper jaw (2).

[(1) Occasionally the inflammation extends from the sockets of the upper molar teeth into the Highmorean cavern, the lining of which becomes inflamed and suppurates. This is accompanied with much deep-seated aching pain, and dusky redness, with tenderness of the cheek. When these symptoms are present, the condition of the cavern may be suspected; and the mouth must be examined, to ascertain whether there be any stumps of teeth in the neighbourhood exciting the irritation. If there be any such, they should be removed, and a probe, or iron wire, or a small trocar must be thrust up the tooth-socket, to open a way into the cavern, by which the pus may escape. This aperture will require for its establishment, the insertion of a little wooden plug, which should be removed three or four times a-day, so that the pus may flow out. It is also a good plan to syringe the cavern with warm water through this hole, especially if the discharge be offensive; and if there be reason to suppose any ulceration of its lining membrane exist, injections of weak solutions of nitric acid may be used with advantage.

(2) "The tumour of the gum, *epulis*, is often," observes Liston (*a*), "a simple growth of the consistence of the structure from which it proceeds, and not likely to be reproduced, if the exciting cause is removed, and the entire disease extirpated; the cause is decay of some part of one or more teeth, of the crown, neck or fang, or it may arise from their being crowded and displaced. The lower jaw is the most common situation of *epulis;* it appears in the front of the mouth, occasionally at the root of the *molares*, and the upper jaw is by no means exempt from it. Some of the large tumours in my collection, removed along with this bone, appear originally to have commenced in the alveolar ridge. The size and extent of *epulis* is various; it may be confined to the gum betwixt two teeth, or it may have been neglected long, have taken in several, and may be attended with alteration in structure of the alveolar processes and their covering. The disease is generally connected with affections of the permanent teeth, but it is met with as a disease of infancy. * * * The tumour is of slow growth; it remains generally of the same firm consistence, and its attachments are broad and firm; its surface, even when large, is covered by membrane, is unbroken, it becomes lobulated, unless it projects from the mouth, and is exposed to injury; the teeth are loosened, and present in various parts of the tumour; around their base some excitement may be kept up, and even some ulceration and discharge. The tumour is not of a malignant nature in general, and even in its advanced stages is not inclined to contaminate the parts in its neighbourhood; if thoroughly removed, it does not return. A soft tumour of the gum, rapid in its progress, broken on its surface, and furnishing fetid and bloody discharge, is sometimes, it is said, met with; there is no danger of mistaking the one kind for the other, the remediable for the malignant; fortunately the latter is rare." (pp. 255, 56.)

I have occasionally, though not often, seen *epulis* of both kinds mentioned by Liston; that which seems merely a luxuriant growth of one particular part of the gum, is most frequent, but that directly connected with the teeth is more rare. Of the latter kind I operated some time since, on a boy of twelve years old; the tumour was about the size of a bean, on the outside of the left branch of the lower jaw, when first observed, but in the course of two years it spread slowly, as far back as the last molar, and forward to the outer incisive tooth; it had risen to the edge of the gum, but had not descended quite so low as the base of the jaw; in front, its lower edge had either absorbed and imbedded itself in the jaw, or bony matter had sprung up around it, as it had there a distinct though irregular edge, but behind the ridge was less marked; its size was that of half a walnut; it was elastic, fluctuating, and seemed enclosed in a tough cyst, thinnest above; the membrane of the mouth moved freely over it. At the operation, the cyst was found to have a cartilaginous feel, and the shell of the jaw-bone evidently involved in it. When opened by a crucial cut, about a drachm of glary fluid was discharged, and at the bottom of the cavity, against the side of the jaw, was the second permanent bicuspid tooth, like the so-called lady (the grinding teeth) in the lobster's stomach. The tooth was drawn, the whole sac removed with scissors close to the surface of the jaw, and the remaining capsule sliced off. The case did well at the time, but eighteen months after he came again with a return of the swelling in the same place, but of a firmer texture. Having lost sight of him since, I do not know what has ensued.—J. F. S.]

885. The causes of *caries* of the teeth are either *external* or *internal*. To the former belong the improper use of acrid acid substances, negligent cleansing of the mouth, alternate use of cold and hot food, tobacco chewing, and mechanical injury of the teeth, by which the enamel is destroyed, and its internal substance is exposed to the air. In most cases, however, *caries* of the teeth depends on an internal cause, namely, on that kind of *caries* which is developed in the interior of the tooth. This opinion is especially grounded on the circumstance, that rottenness of the teeth frequently appears in every member of the same family, that the corresponding teeth on both sides are attacked together, and the *caries* is accompanied with general disease, as rickets, scurvy,

(*a*) Practical Surgery.

mercurial cachexy, bad constitution, weak chest, and the like. The spreading of the *caries* to the neighbouring teeth seems rather grounded on the collection of part of the food, which putrefies, or on the general causes, as in a peculiar participation, from the first, of the affected teeth.

Coffinière imagines that in persons with weak chests, the cure of the toothach should not be effected by drawing the tooth, as by retaining the diseased tooth a good derivation may be kept up (*a*).

886. As to the *treatment* of carious teeth nothing can be done to prevent the further spread of the *caries* than removing the causes and improving the constitution, which in many instances is indeed impossible, as often no actual cause can be discovered.

887. For the purpose of restricting the further destruction of carious teeth many remedies have been proposed, which either destroy the carious part, or protect it from the contact of the air or food. To these belong spirituous aromatic tinctures, ætherial oils, kreosote, and even the actual cautery. In superficial *caries*, the carious part may be removed, by filing or scraping, for the purpose of preventing its effect upon the neighbouring teeth. As to the former remedies, they diminish the sensibility by their irritation of the nerve of the tooth, therefore the pain is lessened, and even the offensive smell of the tooth improved, but the progress of the *caries* is not in the least arrested. Filing the carious tooth, only for the time, suspends the evil; usually it soon reappears, and makes quicker progress than before, especially in old persons. Filling up the carious tooth with thin lead, tinfoil, or with tooth-cement, and the like, (stopping), after the sensibility has been put an end to by acrid remedies, keeps the air and the food from the carious part, but the *caries* is not thereby removed. The cavity of the tooth always increases, and the metal at last falls out.

In order to avoid drawing the teeth, and whilst keeping them in, to get rid of the pain, the destruction of the nerve with hot platina thread or with hot iron, as well as, if the crown be tolerably healthy, the trepanning of the tooth in the direction of its root, by which the nerve is destroyed and then the tooth stopped, as also the introduction of a drop of concentrated sulphuric acid has been employed (Ryan).

[Chelius's observations as to the falling out of the stopping are very correct, and it is frequently on this account necessary to repeat this operation, however skilfully performed. Before stopping, however, it must be ascertained whether the carious cavity be tender on touching with a probe, for if it be, the pressure of the stopping, whatever it may be, cannot be borne, and often excites such violent pain, that the tooth at once requires removal. I much prefer filling the hollow, once or twice a-day, with a bit of cotton steeped in camphorated spirit, as it gradually diminishes the sensibility of the nerve, and sometimes entirely destroys it, so that it either renders the stopping bearable or sometimes even unneeded. All severe escharotics should be avoided, for they often increase the mischief, and compel the removal of the tooth.—J. F. S.]

888. It is most proper to recommend especial care of their teeth to persons affected with carious teeth, consisting in frequently rinsing the mouth, with water not cold, especially after every meal, and in removing with a quill toothpick every thing between and in the teeth. For cleaning the teeth, which should be done every morning, a fine powder of linden wood charcoal and bark, with a not too stiff tooth-brush is best; the mouth should also be frequently rinsed with sage

(*a*) Ondet, Dictionnaire de Médecine, vol. x. p. 174.

water, and some tincture of myrrh or catechu, partly to improve the smell and partly to harden the gums.

889. If the tooth be painful, the *treatment* must be, in reference to the causes which produce the pain. The toothach is often of the rheumatic kind, in which it is not merely confined to the affected tooth, but the pain extends, more or less, over all the teeth of the same row, and over half the face. Warmth is here serviceable, covering the affected side of the face with flannel, a blister behind the ear, and if inflammatory irritation be also present, leeches applied to the affected side. The toothach often arises from bits of food remaining in the hollow of the tooth, which must therefore always be examined and freed from such impurities. If, however, the pain continue, its diminution must be attempted by remedies, which either subdue the excited irritability, as rinsing the mouth with warm water with the addition of tincture of opium, the application of cotton soaked in the same tincture, an opium pill in the hollow tooth, and the like; or, to destroy the sensibility, acrid remedies, the ætherial oils, kreosote on wool in the tooth, have been used, to which also belong most of the empyreumatic remedies recommended against the toothach.

[Toothach commonly so-called is much more frequently arising from inflammation of the lining of the socket than from affection of the tooth itself. It is therefore highly necessary to discriminate between the two, as otherwise a good and useful tooth may be drawn which might be saved, simply by repeatedly leeching the gum; and even when the gum is affected secondarily after *caries*, the tooth may even then be often preserved by this practice, and the exposed nerve becoming gradually destroyed, the toothach after a time subsides, and the pain of drawing the tooth is spared.—J. F. S.]

Among the various remedies proposed, Bedingfield (*a*) advises as an improvement on smoking tobacco, often used for the toothach, the application of the fumes of henbane seed, in the following way:—"Put from one to two drachms of the seed upon a red-hot iron, or some lighted cinders, and immediately cover them over with a basin. As soon as you suppose the seed to be consumed and the vessel impregnated with the fumes, place it upon its bottom and fill it with boiling water. The person affected with the toothach is then to inhale the vapour for twenty minutes or half an hour, a blanket or some other covering being previously thrown over the head and shoulders, to prevent its escape." (p. 492).

890. If the pain cannot be in any way removed, or if the diseased tooth produce any ailment of the jaws, lips, or maxillary cavities, and so on, it must be drawn. This is also necessary if a tooth of the first set prevent the development of the second.

If with carious crown the root be sound, the crown may be removed with a pair of sharp nippers or with a fine saw, and the exposed medullary cavity cauterized, which, however, is usually only employed in the introduction of a tooth.

891. The proceeding in drawing a tooth varies according as the *forceps*, the *key*, the *pelican*, the *punch*, or the *pyramidal lever* be employed. The preference of one or other depends on the condition of the tooth to be drawn, and the individual dexterity of the operator with one or other instrument. In general the drawing of a tooth with forceps, is the least painful; it is, however, only applicable to the front, or to loose back teeth. The key is best, for drawing the hind teeth, as it permits the use of greater force, without injury to the other teeth, and has not any rest upon the neighbouring teeth; the gums are, however,

(*a*) Edinburgh Medical and Surgical Journal, vol. xii. 1816.

thereby frequently crushed, and the tooth not rarely broken. The pelican acts more safely; it is applicable to all the hind teeth and their stumps, the gums are not crushed, and the tooth not easily broken; but the neighbouring teeth must afford it support and are liable to be thereby depressed; the tooth can also be drawn with it only outwards. The punch and the pyramidal lever are only in the removal of stumps.

892. In drawing the *front teeth* of the *lower jaw*, the operator must place himself before the patient, who sits upon a sloping chair; he depresses the lip with the fore-finger of the left hand, puts the thumb on the next tooth, and the other fingers beneath the jaw, and with the *curved forceps* seizes the neck of the tooth as low as possible, makes a little movement inwards and outwards, and then gives the forceps a pull upwards, by which the tooth is drawn. In drawing the *front teeth* of the *upper jaw*, the operator stands behind the patient, who sits on a low stool, separates the lip with the thumb of the left hand, seizes the tooth with the *straight forceps*, moves it a little in and out, and draws it with a pull directly downwards.

893. The *hind teeth* are drawn, either with the *key* or with the *pelican*, In the former case, the operator envelops the bolster of the key with soft linen, after he has fitted it with a claw, of corresponding size to the diameter of the tooth, and places himself before the patient sitting on a common chair. He then fixes the claw of the key with the right hand, if the diseased tooth be in the left side of the jaw, but on the opposite side with the left hand, extends the fore-finger on the stem of the key, fixes the point of the claw, by means of the guiding fore-finger of the unoccupied hand as deeply as possible, on the inside of the tooth, and keeps it fixed with that finger. He then turns the handle in a half circle downwards on the teeth of the lower, and upwards on the teeth of the upper jaw, by which the tooth is either at once drawn, or remains still connected with the gum, from which it may be completely separated with the fingers or forceps. If on account of the inner side of the tooth being destroyed, it must be drawn inwards, the point of the claw should be fixed externally, and the turn made with the handle of the key inwards.

In using the *pelican*, after having chosen a claw proportionate with the thickness of the tooth, and this distance of the point of support from the diseased tooth, and having covered the crown of the instrument with soft linen, the operator places himself behind the patient sitting on a low stool, fixes the pelican with the right hand in drawing a right side tooth, and the contrary, with the left hand, puts the point of the claw as deeply as possible, on the inside of the tooth, fixes the crown against the two neighbouring teeth in front, and the thumb of the unoccupied hand against the inside, and with the other fingers of the same hand grasps the jaw outwardly and beneath. The handle of the pelican is then moved from behind, forwards and laterally, by which its crown is pressed against the teeth, serving as the pressure point, and the tooth is somewhat raised. If there be no adjoining teeth to support the pelican, a piece of cork must serve the purpose.

894. In the use of the *punch*, which is advisable only in teeth not very firmly fixed, the operator stands in front of the patient sitting on the

sloping chair, if the teeth be of the lower jaw, but behind the patient, who is to sit low, if the teeth are of the upper jaw; he fixes the claw of the instrument against the root of the tooth, and the forefinger of the left hand against its inside, and then lifts the tooth inwards and upwards in the lower, and the contrary in the upper jaw.

895. The *stumps* and *roots* of teeth may be removed by one or other of these means. If they be loose, they are especially fitted for the forceps, or punch; those which are firmly fixed for the key, or if there be still neighbouring teeth left, for the pelican. Only when by these methods the stump cannot be removed, must the *lever* be used. The head of the patient is to be supported, the point of the lever fixed sufficiently deep, between the edge of the alveolar process and the root of the tooth, a lever-like motion is to be made to either side, where there is least opposition, and the root lifted out. In very firmly fixed roots, two levers may be applied in the same way on the two sides.

896. The awkward circumstances which may occur from drawing teeth are, breaking off the crown of the tooth, breaking the alveolar processes, bruising, tearing, or complete stripping off the gums, loosening the neighbouring sound teeth, partial dislocation of the teeth, fracture of the jaw, slipping of the claw from a diseased to a sound tooth and its extraction, severe bleeding, inflammation and suppuration of the gums, and *caries* of the alveolar processes.

If the crown of the tooth break off, the removal of its stump is to be attempted as already mentioned. In splintering the alveolar process, the loose pieces must be removed, and those which are fixed pressed into place. Bruising of the gums must be treated with slightly astringent gargles. If part of the gum remain only slightly connected, it must be cut off with scissors. Teeth which have become loose must be fastened to those adjoining with threads, and hard food should be avoided. If a tooth be partially dislocated, the pain is often thereby completely got rid of, and it remains firm in the socket, although *caries* go on; but the dislocated tooth may operate in its socket as a foreign body and cause pain, the gum and the lining of the socket may become affected, and thereby the removal of the tooth be rendered necessary. Fracture of the lower jaw requires its proper treatment. A sound tooth which has been pulled out may be put in again, and fixed by threads to its neighbours.

A slight bleeding occurs after the drawing of every tooth; this is to be permitted for a little while, because thereby is the imflammation of the gum best prevented; washing of the mouth with water and vinegar, and compression of the tooth-socket are usually sufficient to stop it. Frequently the bleeding is very severe, because perhaps the artery going to the tooth is torn, where it is in the bone and cannot retract, or on account of scorbutic *diathesis*. In this case firm compression must be employed, the socket filled with lymph soaked in a solution of alum, in Theden's arquebusade, and the like, or with oak agaric strewed with styptic powder, or with a ball of wax; small compresses are to be put upon these, and the patient made to bite the jaws firmly together. In doubtful cases, the application of the actual cautery has been recommended. In the scorbutic *diathesis* the simultaneous internal use of acids is not to be neglected (1).

The inflammatory swelling of the gums requires a soothing treatment, bathing with warm milk, figs boiled in milk, and so on. In general it runs on readily to suppuration, and if the abscess do not soon burst of itself, it must be opened with a lancet. The aperture usually closes under the continued use of soothing gargles. *Parulis* requires the same treatment if caused by a decayed tooth, and if that be the reason of the aperture not closing, the tooth must be drawn. If there be *caries* of the alveolar process, it must be treated according to the general rules.

[(1) The bleeding which ensues occasionally in consequence of drawing a tooth of a person who has hæmorrhagic *diathesis*, is a matter of very serious consequence, and has sometimes destroyed life. I have seen several severe, though not fatal cases of this kind, and as it seemed to me that the blood came from the very bottom of one or other of the fang-sockets, when the tooth had more than one, I presume that the bleeding vessel was the proper artery of the tooth, and that the difficulty in arresting the hæmorrhage depended on the difficulty of getting at the vessel itself; for unless it can be immediately acted upon, whatever be the local application, it is sure to fail. Various remedies have been proposed; I have tried most of them without success, but I have never failed with the actual cautery, when I have properly applied it, that is, when its point has been sufficiently small to descend into the very bottom of the fang-socket. When I first had recourse to this practice I failed from not thrusting the hot wire (which makes the best cautery for this purpose, and should not be more than a line thick) down to the very bottom of the socket; but having corrected this error, I have never failed since, in at least half-a-dozen cases; and, therefore, believe that its inefficiency in the hands of others has arisen from the same cause which at first foiled me. There is nothing very frightful in the employment of this remedy, nor does it produce more than momentary and slight pain, and I think it is, therefore, best to resort to it at once without wasting time, and allowing the patient to lose blood to such extent as to disturb the constitutional powers, and excite any latent phthisical tendency, of which I have known an instance.

Blagden mentions (*a*) the case of a person, who, whilst a boy, after the extraction of a tooth, bled from the socket for twenty-one days. Whenever he cut himself, or received a sligh wound, there was always great difficulty in stopping the bleeding. At twenty-six years of age he had a trifling wound on the foreheaed, which bled profusely, and could not be stopped by pressure or styptics, or even by tying both ends of the artery, but was finally checked with caustic potash, which caused a large slough. In the next year he was much troubled with *caries* of the second upper molar tooth, which, remembering what had previously happened, he bore with for some time, and but at last the pain became so severe that he had the tooth drawn *June* 30, 1816, at its bottom was an abscess; free bleeding immediately ensued, and this continuing on the next evening, Blagden being called to him, applied lunar caustic to the bottom of the socket without effect; then introduced a sponge tent soaked in solution of sulphate of copper, which checked the bleeding for a few hours, but it recurred, and continued profuse, notwithstanding that the socket was carefully plugged. On the morning of *July 4th*, Brodie applied the actual cautery, and stopped the bleeding for six hours, but in the evening it broke out afresh, as violent as before, notwithstanding the socket was again carefully plugged, and the cautery twice applied; in doing the latter, a large quantity of matter apparently from the maxillary sinus, escaped. The bleeding still continued, and next day the patient being very low and depressed, although he had never fainted, it was determined to tie the common carotid artery, which was done by Brodie at 10 A. M., but "the hæmorrhage still continued. The wound made in the operation bled very little at first, but in the course of a few minutes after the operation it began to bleed profusely. No single vessel could be observed bleeding, but there was a general oozing from its surface. Ice was applied to the wound, and while this was continued the bleeding from it was suppressed, but it returned immediately on the ice being removed. Ice was also applied to the left side of the face, and there was reason to believe that it stopped the bleeding for a few hours; however, the hæmorrhage afterwards returned, and

(*a*) Medical and Chirurgical Transactions, vol. viii. 1817.

the patient died at 5 A. M. on the *7th July*, a week from the time of the removal of the tooth." (pp. 224–27).

The following case was under my own care :—

C. K., aged 20 years, a leather-dyer, of delicate frame and not very temperate habits, was admitted into Georges's Ward.

June 17, 1837. Twelve years since had leeches on his left arm, which bled for several days. Three years ago had leeches on his hip, which continued bleeding for three or four days. Eighteen months since had the first right upper bicuspid tooth drawn, which did not cease to bleed for four days. On the 12*th* of this present month, at 8 P. M., he had the second left upper molar tooth pulled out, which was immediately followed by considerable bleeding, and which continued during that night and the following day and night, he only attempted to stop it by frequently washing his mouth with cold water. On the morning of the 14*th* he went to his medical attendant, who applied nitrate of silver to the fang-socket; the bleeding ceased for a couple of hours, but recurring, he introduced some nitric acid, which, however, only checked it for a short time, and the patient was content with washing his mouth with cold water till 1 P. M. of yesterday afternoon, when he came to the hospital, and the dresser plugged the socket with sponge dipped in tincture of myrrh and alum; after which the bleeding ceased for eight hours, but then came on again, and continued through the night till 11 *o'clock* this morning, when he came again to the hospital, and the dresser applied a hot wire to the socket, which checked but did not stop the bleeding entirely. It soon, however, burst out afresh, and at 7 P. M. he returned to the hospital, and having been admitted, the dresser applied muriatic acid, but without effect. I saw him soon after, and having cleared away the clot, found two bleeding points, one by the alveolar partition of the third molar tooth, and the other deeper in the socket. To these I applied the actual cautery at a black heat, and the bleeding ceased, but soon recurred ; and when I saw him again four hours after, I found a clot about the socket as big as a nut, with a free arterial stream flowing from beneath it; this I removed, plugged the socket with cotton steeped in *tinct. benz. comp.*, and directed pressure should be kept up so long as there was any bleeding. After four hours it seemed to have stopped, but in half an hour burst out again and continued through the night. At 8 A. M. *June* 18, a pencil of lunar caustic was introduced, and the surface of the socket being freely cauterized, the bleeding was checked for a short time, but the oozing soon recurred, and when I saw him three hours after, a fresh clot had formed and the bleeding continued as before. I tried to make pressure upon a pad of cotton thrust into the socket, with a bell-spring carried over the crown of the head, but could not affect it. I then made a paste of tannin and cotton mixed with spirits of wine, thrust it into the socket with a probe, and pressed it down with the finger till it had become converted into a concrete, by which the bleeding was completely stopped, and so continued for six hours, when it broke out afresh, and continued streaming till 8 P. M., at which time I saw him again, found the plug thrust out completely and the socket filled with clot. This I removed entirely, and after squeezing for a few minutes the soft parts about the socket, which were swollen, with my finger, and the lint which gave him great pain, but stopped the bleeding, I left the socket alone, and applied linen dipped in spirits of wine as an evaporating lotion on the cheek. His bowels not having been relieved for the last two or three days, three grains of calomel, with some infusion of senna and sulphate of magnesia, was ordered forthwith. No bleeding for five hours, after which it came on again, but pressure being made for a little time, it ceased for an hour, and then returning, continued through the night till I saw him at 11 A. M. of the 19*th June*, when I removed a clot as big as a walnut, and plugged the socket with cotton steeped in kreosote, and ordered one grain of acetate of lead three times a-day. There was no bleeding for twelve hours, but it then returned and continued through the night till next morning, when I saw him, and having cleared out all the clot and made a little pressure, it ceased. As he complained of pain in his belly, the lead was omitted after he had taken four doses. In the evening the bleeding returned, but was stopped during the whole night by plugging with cotton and kreosote. On the morning of the 21*st June* the bleeding returned, a fresh clot formed and the oozing from beneath it as before. On the 18*th* he had not appeared to have suffered much, his countenance was not particularly pallid, and his pulse, though rather quickened, was firm and free from hæmorrhagic jerk; but now he is pallid, complains of faint-

ness, the pulse is quick and has the jerk which has not been previously noticed. On consultation with my colleague GREEN, it was determined to apply the actual cautery again; and having made a careful examination, I was only able to discover one fang-socket, through which however the probe readily passed into the maxillary cavern. I then passed a conical iron at a black heat to the very bottom of the socket, which caused great pain, as I expected, from the already irritable and inflamed state of the parts after so much handling; and I also seared the sides of the cavity and the gum, from which there was some oozing. The bleeding then ceased. He was ordered to take every eight hours two grains of acetate of lead, with half a grain of opium. There was no recurrence of the bleeding after this; the lead was continued for two days and then left off, and in the course of a week he was quite well and left the house.

On the *4th March*, 1841, he had the second left lower molar tooth drawn at the hospital, from which, excepting a very few hours, bleeding continued till his re-admission,

March 8th. The socket was then filled with putty by the surgeon in attendance, and over it a pad of lint, by which it was stopped for about twelve hours, when it burst forth again, and continued through the night. On the following morning two irons of different size were introduced into the cavity at a red heat, but the bleeding was not checked till the socket had been plugged with lint steeped in tincture of myrrh. After twelve hours the bleeding returned, continued through the night, and till the afternoon of the *10th March*, when a small iron at black heat was introduced, and lint soaked in solution of alum applied to the part; after sixteen hours the bleeding returned, and on the morning of the *11th* he had a little bleeding from the left nostril. The solution of alum was continued, and now was ordered *pulv. gallarum, alum. sulph.* āā gr. v. *4tis.*, but without benefit, and at 3 A. M. *March 12th*, a small iron at black heat, was introduced; but the bleeding did not cease till the socket was plugged with lint soaked in alum. At 9 A. M. the bleeding returned; a bladder of ice was then applied to the throat and cheek, and he was ordered *plumb. acet.* gr.j. *op.* gr ¼ *secondâ quâque horâ per sex vices, tunc tertiâ vel quartâ quâque horâ per sex vices sequentes et postea sextâ quâque horâ.* There was not any recurrence of the bleeding till the evening of the *14th March*, when he again bled freely, and the lead and opium were again ordered every two hours, but on the following day, only every four hours. *March 16th*, he was directed to take a grain of muriate of morphia, which was continued for a few days. On the *18th* the bleeding was again free, but finally stopped on the *21st*; and he left the house well on the *29th*.

How long the lead was continued in the second part of this case, the notes I have quoted, which were not my own, do not distinctly state, and I think it doubtful whether the cure was to be ascribed to it or simply to the loss of blood, by which in a case related by DAVENPORT (*a*), the bleeding had certainly been put a stop to after thirty hours' continuance, and depressing the patient very considerably. I cannot help, however, thinking that in the second part of this case the actual cautery was never effectually applied; for as I have said before, I have never failed when using it, neither has my colleague GREEN, who also employs it.

From the above cases it will be perceived how various have been the remedies made use of to stop these violent bleedings after drawing a tooth, but many other plans have been advised and strongly urged as most efficient. Some persons re-insert the extracted tooth in the socket as the best plug which can be used. CORTEZ (*b*) recommends the introduction of a wax model into the socket, which he has found effectual in three or four instances. PETER CULLEN (*c*) prefers a very fine soft phial-cork gently squeezed into the socket, and upon the point of the cork, a bit of lint with some styptic may be put. KENDRICK (*d*) advises a pledget of cotton dipped in the strongest alcohol as very efficacious. And among the cases of hæmorrhage effectually treated with the internal use of ergot of rye, one of bleeding after drawing a molar tooth is given by Dr. RYAN (*e*).

An interesting circumstance in reference to these cases is, that not unfrequently other individuals of the family to which the patient belongs, are subject to this bleeding disposition. It was so in my own patient's family, and with that of KENNEDY's patient, and I have known it in many other instances.

(*a*) Medical Gazette, vol. ii. 1842. New Series, p. 58.
(*b*) Ibid., vol. iv. p. 490. 1829.
(*c*) Medical Gazette, vol. v. p. 564. 1830
(*d*) Ibid., p. 788.
(*e*) Ibid., vol. xiii. p. 368. 1833.

It is scarcely needful to observe, that if the practitioner be aware of the patient or his family being subject to this disposition to bleed, he should be extremely cautious in undertaking the removal of a tooth, or indeed of any operation; and if compelled to resort to it, should at once be prepared to attempt arresting its bleeding at the onset, and not permit its continuance for hours, much less for days, before employing any efficient remedy.—J. F. S.]

897. Tooth-fistulas (*par.* 883) require the speedy drawing of the decayed tooth, and the use of astringent gargles. If the fistula do not then close, it is probable that there is still another decayed tooth, which must be drawn; or *caries* of the alveolar process may exist, which must be treated in the usual way.

Carcinomatous excrescences on the gums (*par.* 884) are mostly consequences of a decayed tooth or of a carious part of the alveolar process. They must be removed from their base with the knife, and the great bleeding which generally ensues must be stopped with astringent remedies and pressure, or with the actual cautery, which last is also serviceable in preventing the recurrence of the excrescence. If after the removal of *epulis* a decayed tooth or *caries* of the alveolar edge be discovered, the former must be drawn, and the latter treated according to the general rule.

Cancerous sores and schirrus will be considered with degeneration of the organic tissues.

II.—OF FISTULAS.

(*Fistulæ*, Lat.; *Fisteln*, Germ.; *Fistules*, Fr.)

898. Unnatural, old apertures, by which fluids are emptied from any cavity or duct externally, or into another cavity, are called *Fistulas*. By this definition fistulas are distinguished from fistulas sores.

["The term 'fistula' gives a very inadequate notion of the disease," observes JOHN HUNTER, "the fistulas canal being only the sign of the disease,—the means of conveying a fluid or extraneous matter to the surface. A fistula is the consequence of the powers of a part not being able to remove the original cause, so that the original cause and some of its effects remain." (p. 577)].

899. The cause of fistulas, are either injuries, by external violence, of the cavities in which the fluids are collected, or of the ducts by which they are discharged, if they be not cured by quick union, or stopping up of the ducts, by which the fluids collected in large quantities produce tearing, inflammation, suppuration, and mortification, causing extravasation of the fluid, and the cellular tissue, and an unnatural opening for its escape; or inflammation and ulceration on or in the walls of the cavities and ducts, by which the latter are destroyed. Fistulas, if not consequent on injury, usually commence with abscess, which on bursting, discharges pus of different kinds, by one or several apertures, communicating either directly with the cavities, or running in various turns and windings. If the fistulous passage be very short, it diminishes in size, as the inflammation lessens, the external opening contracts, and its edges scar, but without closing. If the fistulous canal be longer, the external opening contracts, is surrounded by a little fungous wall, which presents in its middle a narrow and often scarcely observable opening. By the continuance of the inflammation,

to a certain degree, in the whole canal, and in the neighbouring parts, the whole internal lining of the canal is gradually converted into a mucous tissue, distinguished only from true mucous membrane, by the absence of mucous glands, and of the epidermoidal covering, and itself prevents the healing of the canal. But, for the most part, in long continued fistulas, the neighbouring parts become hardened, and form, more or less, grayish white, thick hard masses, (*callosities*), between which the fistulas run. The same changes also occur in fistulous passages (*par.* 65).

["The causes of fistula," says HUNTER, "are various, but may be divided into two classes:—*first*, the obstruction of the passage of some natural secretion, as fistula of the parotid gland; or of the canal for the passage of extraneous matter, as the intestines being strangulated, so as to mortify, or being wounded; but all obliterations of the ducts, where the fluids make a new passage, will not be termed *fistulæ; secondly*, the formation of pus or extraneous matter in a part requiring a passage, as in *fistula in ano*, fistula in the joints, and fistula from diseased bone." [It will be observed that this second class of fistulas has not been enumerated by CHELIUS, although, however, he subsequently treats of them.—J. F. S.] "We shall consider the cause of fistulas,—1*st*, The obliteration of ducts, or canals, is the first cause. This arises from obstruction of the natural passage, in consequence of which a new one is formed for the passage of the natural secretion. These obliterations often arise from a thickening of the sides of the ducts, as in the *urethra*, nasal duct, &c., from inflammation; sometimes from the venereal disease, or *scrofula*; and sometimes from accident, as in the parotid duct. These obliterations are often very troublesome, obstructing the evacuation of the natural secretions, which is very teasing to the part, and when complete is very serious in its consequences. In most there is a new passage when complete, which is made by inflammation and ulceration; these new passages are called fistulous; the discharge is the natural secretion, mixed with the pus from the inflamed vessels of the sides of the passage. If this new passage answers all the purposes of the original one, it cannot well be called fistulous; when from a mortified or wounded intestine, it is called an artificial *anus*; when in the *perinæum*, it is for the passage of the urine. There are often accumulations of secreted juices besides the above, arising from the same causes and producing the same consequences, yet not called fistulous." (pp. 577, 78). 2*d*. The second species of fistula or that from disease, arises from the disproportion in the disposition to heal of different parts, viz., the internal and external; the skin healing, while the deep seated parts or seat of the disease, have no disposition for it. It may arise from two causes: 1*st*, from any extraneous substance in the inner parts; 2*dly*, from a diseased state of the original part when the disease formed. The first happens in large deep-seated abscesses, which are prevented healing at the bottom by the pressure of the matter. The second has two causes; the first, from the part being naturally indolent, as tendons; the second, from a disease in parts naturally ready to heal, but the disease being deep-seated, the skin is more ready to heal than the bottom of the *fistula*, and thus obstructs the necessary free discharge." (p. 579)].

900. The *prognosis* in fistula depends on the possibility of conducting the fluid through the natural ducts; further, on the condition of the fistulous openings, whether they be accompanied with or without loss of substance, whether they communicate immediately, or by a more or less long canal with the cavity, or with the duct, and whether their walls be converted into a mucous tissue, or callosities. In fistulas of long standing that part of the duct in front of the fistulous opening, and through which fluid no longer escapes, loses its natural area, shrivels up, and the cure is only possible by making an artificial aperture in the cavity, into which the fluid should be conveyed by the natural duct, as for instance, in Salivary Fistula.

901. The indications for the cure of fistulas are, therefore,—1. The *restoration of the natural ducts and the conduct of the fluids from the fistulas.* This is usually sufficient, and the fistula closes of itself, if the mucous lining, or the callosities have not formed. In this case the canal of the fistula must be either divided, or a sufficient degree of inflammation and adhesion produced by stimulating remedies and suitable compression. The callosities usually subside, if the flow through the fistula be prevented by the use of soothing applications. 2. The *establishment of an artificial duct*, if the restoration of the natural passage be not possible, which effected, the fistula closes, either of itself or under the above-mentioned treatment. If the fistula be an immediate opening to a duct, without narrowing of the latter, cauterization about the fistulous opening is the best remedy to produce gradual lessening and ultimate closing of the fistula. The paring the edges of the fistula, and their union, has rarely had satisfactory results. This treatment by cauterization (with caustic remedies or with the actual cautery) is founded on the central contraction occurring in burns (*a*). If with such fistula there be considerable loss of substance, the opening can often only be closed by implanting or drawing forward skin from the neighbourhood.

["The cure of *fistulæ*" observes JOHN HUNTER, "consists in first removing the immediate cause; for frequently they get well by simply removing the obstruction. * * * The cause of our first division of *fistulæ*, arising from confined matter, is sometimes easily removed, but not always, by opening the suppurated part in the most depending situation, when if the parts are readily disposed to heal, a cure takes place. The second, from a diseased state, must have the disease removed or extirpated if possible; but this is often impracticable. A perfect exposure is the next object; but the case will not often admit of it, and then becoming incurable, it some times produces hectic, as in lumbar abscesses and abscesses of the liver which open externally, but cannot be exposed. The constitution in such cases is to be most attended to, and every thing done to lessen the irritation; but in most cases life is miserable, and we only protract it a little longer by our best efforts." (p. 581)].

A.—OF SALIVARY FISTULA.

(*Fistula Salivalis*, Lat.; *Speichelfisteln*, Germ.; *Fistule Salivaire*, Fr.)

DUPHÉNIX, MORAND, LOUIS, Observations sur les Fistules du Canal Salivaire de STÉNON; in Mém. de l'Acad. de Chir., vol. iii. p. 431.

DESAULT, Œuvres Chirurgicales, vol. ii. p. 216.

VIBORG, Vorschlag zu einer verbesserten Behandlung der Speichelfistel; in Sammlung von Abhandlungen für Thierarzte, Copenhagen, 1797, vol. ii. p. 33.

JOBERT, Observations des Fistules Salivaires, suivies de quelques réflexions sur ces Maladies; in Arch. Génér. de Médecine, 1838, Sept., p. 58.

902. *Salivary Fistula* is characterized by an opening surrounded with callous edges most commonly very narrow, in the neighbourhood of STENO'S duct, or of the salivary glands, out of which the spittle flows, especially during talking and chewing. The flow of spittle is often so great, that loss of appetite, disturbed digestion, and wasting result from it.

903. Salivary fistula is produced either by accidental injury of the salivary glands, or their ducts, if the first union do not take place; or

(*a*) ROSER, Ueber eine besonders Art von Fisteln, welche durch Cauterisation im Umfange der Fistelöffnung zu heilen sind; in Archiv. für Physiologische Medicin, von ROSER und WANDERLICH, 1842, pt. i. p. 145.

by ulceration of this tissue, or by the salivary duct being stopped up by means of stony concretions; and in the latter case, a fluctuating swelling arises in the course of the duct, which gradually enlarges, bursts, and discharges the spittle.

904. The *treatment* of salivary fistula varies according as it is situated on the duct itself, or on one of the small ducts from the gland.

905. The salivary fistula, which can be distinguished, partly by its seat, and partly by a probe introduced from the mouth into Steno's duct, is usually cured by continued pressure, which diminishes the secretive activity of the gland. A compress an inch and a half thick is to be put on it, and fastened with the halter bandage. At every renewal of the bandage, camphorated oil is to be rubbed upon the region of the gland, and the fistulous opening touched with lunar caustic. The mere repeated application of caustic, especially of nitrate of silver, is commonly sufficient for the cure.

906. The treatment of fistula of the Stenonian duct, consists either in the *restoration of the natural passage for the spittle, or in the formation of an artificial passage by which the spittle may flow into the mouth.*

907. The restoration of the natural salivary duct, is only possible when its division has not been of long standing, and the lower end is still pervious, which may be ascertained, with a fine probe, from the mouth, or by injection into the fistulous opening. The modes of treatment proposed for this purpose are,—1. The union of the edges of a recent division by the twisted suture, in which one, two or three stitches, according to the size of the division, are put in. 2. The introduction of a silken thread, by means of a delicate eyed probe, through the lower end of the duct into the fistula, and its removal when the duct is thought to be sufficiently widened; after which the fistula closes, either of itself, or by the application of caustic (*a*). 3. Compression of the duct from the fistula up to the gland, in consequence of which œdematous swelling of the gland and the neighbouring parts ensues, which soon destroys the use of the divided parts (*b*). 4. The efficient touching of the fistulous opening with nitrate of silver, or the application of a paste of sublimate and bread crumbs moistened with decoction of marshmallows, which should be covered with a compress dipped in spirits of wine, and supported with a suitable compress, for the purpose of preventing the escape of the spittle by the slough produced, and also to induce its flow into the lower end of the duct. By this plan, as well as by compression of the duct, in most cases its closure and destruction is effected, which Desault and Richter aim at in reference to the salivary gland, by endeavouring to destroy its function with continued pressure.

Schreger (*c*) also notices a fistula which closed by compression of the duct behind it, with a steel neck circlet descending from the top of the head, and by touching it with lunar caustic. Here also belongs Viborg's proposition in cases of salivary fistula, where the usual modes of treatment have been inefficient, to lay bare the hinder end of the duct, by a cut directly down from the cheek-bone, and to bind and unite the wound with sticking plaster. In this way, from Viborg's experiments on brutes, it results, that after tying the Stenonian duct, the parotid gland swells, gradually subsides, and the destruction of the gland is effected.

(*a*) Louis and Morand, above cited.
(*b*) Masseneuve; in Mémoires de l'Acad. de Chirurg., vol. iii. p. 452.
(*c*) Grundriss der chirurgischen Operationen vol. i. p. 84. Third Edit.

908. The production of an artificial duct is the usual mode of treating a salivary fistula, and is always indicated, if the division of the duct have been of long standing, the fistulous opening callous, and the lower end of the duct have become impervious. It is effected in different ways:

1. The callous edges of the fistula having been pared with the knife, a tube with a small trocar is thrust through the cheek, near the hinder opening of the salivary duct, somewhat downwards, and in an oblique direction, in doing which the tongue is to be defended from injury by the finger introduced into the mouth, or by a piece of cork. The trocar is now withdrawn and a thread of silk-worm gut introduced through the tube, which is also then to be removed. The patient should now chew, for the purpose of discovering the aperture of the salivary duct by the flow of the spittle, and the gut in the wound is then to be thrust into this opening for about six lines; the patient then chews again to see whether the spittle flows out between the gut and the wall of the duct, on failure of which, a thinner gut must be introduced. The end of the gut hanging in the mouth is to be brought out to its corner, and fastened with sticking plaster on the cheek. The edges of the wound are to be brought, by properly applied sticking plaster, into the closest union, covered with lint, which should be fastened with sticking plaster, and a cloth placed beneath the chin and bound together on the head. The bandage must not be renewed till the edges of the wound have united, which happens in from thirty to forty hours, if the operation succeed; and some hours after, the gut also may be removed.

De Roy was, according to Boyer (*a*), the first who employed an artificial opening by means of perforating the cheek, for which purpose he used the actual cautery which he thrust directly from without inwards.

Percy (*b*), after penetrating the cheek, introduced a leaden thread into the upper end of the Stenonian duct, and the other end of the thread through the artificial opening in the mouth, where he bent it round, and fixed it by slight pressure of the cheek against the teeth. This treatment renders the suture and cauterization unnecessary.

2. The cheek being penetrated, as in the former case, a leaden thread or string is introduced through the tube, the two ends of the thread bent round like a hook after the removal of the tube, and left for four or six weeks; the external fistulous opening, after having been pared, is to be closed with sticking plaster. For the purpose of rendering the opening callous, after perforating the cheek, the introduction of a sufficiently thick thread, first smeared with digestive salve, and subsequently with drying remedies, and to be moved daily till suppuration have ceased, has been recommended; in that case, the closing of the external fistulous opening first takes place, which, if small, may be effected by frequent touching with lunar caustic; or, if larger and very callous, by paring with the knife, and drawing together with sticking plaster. The aperture is also sometimes attempted to be kept open, by the introduction of a golden or leaden tube, over which the external wound heals.

Duphœnix penetrates the cheek with the bistoury, and puts a canula into the inner half of the wound, for the purpose of preventing its union, and at the same time to conduct the spittle into the mouth, till the external wound, the edges of which are brought together with sutures, has healed.

(*a*) Traité des Maladies Chirurgicales, vol. xvii. p. 276.

(*b*) Boyer, above cited, p. 280.

Atti (*a*) introduces, into the opening made with the trocar, a leaden canula, the end of which in the mouth he splits into three, and bends back on the membrane lining the cheek; the outer end must not reach the skin, and is kept in its place by a thread carried round the ear. After a sufficient time the thread should be divided, the canula removed from the mouth by the nail of the fore-finger, and the internal opening remains permanent.

3. The membrane of the cheek is to be penetrated twice, obliquely at the bottom of the fistula with a trocar, and through these openings a leaden thread is introduced, the middle of which should lie in the bottom of the wound, and the ends projecting within the mouth, are to be brought together and cut off near the inside of the cheek. The external wound is to be closed by the twisted suture. The spittle flows along the leaden thread into the mouth, the external wound closes, and the thread drops into the mouth. This treatment is preferable to the others, as no repeated bandaging of the wound is necessary. I have proved this plan in several cases where other modes of treatment have been employed without benefit (*b*).

Croserio (*c*) proposes, instead of perforating the cheek from without to within, according to the plan of Deguise and Beclaird, to thrust the trocar from within outwards, also to make the second perforation with a trocar from without inwards, the canula of which has no shoulder, and therefore after the introduction of the leaden thread may be withdrawn through the mouth.

4. In simple fistula, the membrane of the cheek should be pierced with the bistoury, and the external edges of the fistula brought together. But complicated fistulas must be cut out, and the outer edges of the wound brought together (*d*).

Bonafont (*e*) exposes the Stenonian duct to the extent of a centimètre, isolates the corresponding ends of the fistula for some millimètres, perforates the cheeks with a trocar, draws the ends of the Stenonian duct, with a thread into the canula, which is left behind, and fastens the thread in a cleft of the canula. The union of the external wound is effected by suture.

[The fistulous orifice into the parotid duct, resulting either from abscess of the gland or any other cause, is not so easy of union as Chelius would wish to infer, but on the contrary often very tiresome to treat. Desault punctured the cheek with a trocar and canula, through the fistulous opening, and introduced a seton into the mouth. The seton was removed daily, and gradually increased in size till a permanent passage into the mouth was formed, and then the seton having been removed, the external wound which had been left open, was touched with caustic and healed. Beclard in two cases successfully employed a leaden style, one end of which he passed into the mouth and the other into the interrupted duct, and completed the operation by bringing together the edges of the external fistulous orifice, which had been previously pared, with a twisted suture. A much more simple and equally effectual plan is to pass, through the fistula in the cheek, into the mouth a needle and thread, the latter of which is to have a knot made on its end, only of sufficient size to be received when drawn from the mouth into the bottom of the fistulous aperture. The end in the mouth is to be tied on a little bit of stick close to the inside of the cheek. In the course of two or three days the knot ulcerates into the mouth and a new way is formed, by which the secretion of the gland passes, and if the case turn out well, the fistulous orifice soon contracts and heals, care being

(*a*) Begin; in Dict. de Médec. et Chirurg. Prat., vol. viii. p. 225.

(*b*) Deguise; in Journal de Médecine, etc., par Corvisart, etc., vol. xxi.

Beclard; in Archives Générales de Médecine, Octobre, 1824, p. 285; in Richerand, Histoire des Progrès récens de la Chirurgie, p. 38.

Vernes; in Journal Général de Médecine, Nov. 1828, p. 270.—Does he use a golden thread in the same treatment?

(*c*) Archives Générales de Médecine, Mai, 1825, p. 137.

(*d*) Jobert, above cited.

(*e*) Annales de Chirurgie, Août, 1841.

taken by a compress to prevent the saliva finding its way out externally. Sometimes, however, it is very difficult to induce the external wound to unite, and the production of a new surface, either by paring the edges or touching with caustic, and keeping them in apposition is necessary.—J. F. S.]

909. It is always necessary that the patient, when the external fistulous orifice is to be closed, should keep the lower jaw as quiet as possible till the cure is completed; and only take fluid food through a tube. A carious tooth is often the cause of failure of the operation for salivary fistula, and must therefore be removed before the operation is repeated.

910. The swelling up of the Stononian duct into a fluctuating tumour, which must be distinguished from an encysted tumour, may if the duct only be stopped up, be perhaps removed by the introduction of a fine probe. If this be not possible, the swelling should be opened with a lancet from the mouth.

If a stony concretion have formed in the salivary duct, it must be cut upon within the cheek, and taken out. The continued flow of the spittle prevents the closing of this opening.

["The ducts both of the parotid and submaxillary glands," says SYME (*a*), "are liable to become the seat of calcarious concretions, which are named salivary calculi. Their composition is phosphate of lime, agglutinated by a small quantity of animal matter. They have usually a yellowish-white colour, oval figure, and finely tuberculated surface. They vary in size from that of a millet-seed to that of an almond with the shell. In the parotid duct, they are very rarely met with, but in the submaxillary duct, not unfrequently. [I doubt their frequency even in the submaxillary duct; ASTLEY COOPER in his Lectures used to mention having removed one from the mouth of the elder CLINE, and LAWRENCE in his Lectures (*b*) speaks of having taken out one "which was about the size of a small bean." (p. 765.) In the Museum of the Royal College of Surgeons of England there are only six specimens, either from the duct or substance of the submaxillary gland; but one from the parotid gland; and some small concretions from the tonsils. Besides these I do not know of any other instances, and have never seen one.—J. F. S.] "They occasion pain, swelling, and hardness," continues SYME, "and sometimes impede the flow of the saliva or give rise to the formation of an abscess. In the parotid duct the symptoms thus produced are apt to be confounded with those of rheumatism, toothache, gumboil, or suppuration of the maxillary *antrum;* while under the tongue, they may be occasionally mistaken for those of encysted tumours. In all cases of doubt it is right to search the duct with a probe, and to feel for the *calculus*, by pressing on the place where it is suspected to be. So soon as a free incision is made, the concretion escapes, together with the fluid accumulated about it. The original situation of these concretions is immediately within the orifice of the ducts; but they have also been found imbedded in the substance of the submaxillary gland, where they excited an increased and unhealthy secretion, with general swelling and hardness of the gland. In such cases the calculus, if distinctly recognised, may be extracted by cutting down upon it, from the mouth." (p. 427).

Among the specimens at the College (*c*) there is one large submaxillary *calculus* an inch and a half long and three quarters of an inch broad, taken from a very old man, who "was conceived to be dying, being nearly choked by the tumour, when in consequence of an effort, the *calculus* was thrown out and he recovered." In another the stone is stated "to have occasioned a quinsy." One specimen was removed after it "had been twelve years breeding," and another "formed in twelve days." (p. 191.)—J. F. S.]

(*a*) Lancet, vol. ii. 1830.
(*b*) Principles of Surgery.
(*c*) A descriptive and illustrated Catalogue of the Calculi, &c., &c., contained in the Museum of the Royal College of Surgeons in London. 1845. 4to.

B.—OF BILIARY FISTULA.

(*Fistula biliosa*, Lat.; *Gallenfistel* Germ.; *Fistule biliaire* Fr.)

911. *Biliary Fistula* originates in a division of the gall-bladder, or ducts, after they have become adherent to the *peritoneum*. The bile is poured from the fistulous opening, and although its loss be often very considerable, it is rarely that important symptoms are produced. Not unfrequently the fistulous opening closes of itself, in general after the escape of a gall-stone; often it breaks again, and the patient then usually finds himself better. The fistula is mostly situated in the region of the liver; frequently, however, at a tolerable distance from it.

I have observed the case of a woman in which, after severe symptoms, a fistulous opening formed near the navel, and out of it a considerable quantity of gall-stones, of the size of peas, escaped from time to time.

912. The cause of biliary fistula is usually a collection of bile in the gall-bladder, (*Hydrops vesiculæ fellis*,) by which is formed beneath the short ribs a swelling, at first defined, regular, and fluctuating, which slowly increases, and is accompanied with pain, that had existed previous to the swelling and at first not severe. It often is diminished by pressure, or spontaneously when the gall-bladder is much distended, in which case part of the bile is forced into the intestine, and is followed by bilous stools, with colicky pain. These symptoms distinguish the filling of the gall-bladder from abscess of the liver. If the swelling of the gall-bladder be considerable, it adheres, by means of the inflammation set up in it, with the *peritoneum*, and forms an opening by ulceration, through which the bile escapes. Gall-stones are usually the cause of this collection of bile. The gall-bladder or the bile-ducts may also be ulcerated by abscess; in which case, after it has opened, pus is discharged, mixed with bile.

[Biliary fistulas, from whatever cause, are very rare. I have never seen a single example of this disease; but I much doubt the possibility of distinguishing its precise origin. It certainly is possible that if, when the bile-duct is stopped, the gall-bladder be over-distended, it may adhere to the wall of the belly, and that ulceration may ensue, by which its contents are discharged externally, and the aperture may continue fistulous. But there is in the museum of St. Thomas's Hospital an enlarged gall-bladder, from stoppage of the common biliary duct, capable of holding at least three, if not four pints, of fluid, which did not ulcerate, but was mistaken for an abscess of the liver, and tapped once or twice, and also another, in which the duct being stopped, the gall-bladder had become adherent to the *duodenum*, ulceration between them had taken place, and the bile thus finding an immediate passage into the bowel, the gall-bladder ceased to serve as a receptacle and shrivelled to the size of an almond. And it is in this way probably that the gall-bladder more frequently empties itself than externally.

The aperture by which abscess in the liver discharges itself, may become fistulous, and have the bile flowing from it, at first, mixed with pus, but afterwards almost, if not quite pure. My friend Dr. Roots informs me he has seen one case in which after an abscess of the liver, bile was discharged; and my dresser, Guest, tells me, that he saw in the Manchester Infirmary a man who, two months after falling on his loins, had an abscess burst in the right hypochondriac region, from which pus and bile at first escaped, subsequently only bile; and that he had seen this person alive, and in tolerable condition as to health, eighteen months after the accident although his motions being very white, it is probable that little bile could have assisted in the process of digestion.—J. F. S.]

913. The *cure* of biliary fistula requires first, the removal of its

usual causes, viz., gall-stones (the existence of which is shown by the careful introduction of a probe). After which the fistula soon closes of itself. For the removal of the gall-stones, the enlargement of the fistulous orifice is necessary, which is best done with catgut, or with a tent, so as not to destroy the adhesion of the gall-bladder to the *peritoneum*, under which circumstances effusion of bile into the cavity of the belly would occur. The fistula must be so much enlarged, that a pair of forceps may be introduced with the left fore-finger, the stone grasped therewith and withdrawn; in doing this, care must be taken, in moving the forceps about, that no part of the gall-bladder itself be caught hold of. The opening of the fistula should not be closed, so long as gall-stones are believed to be still there; otherwise the fistula will break out afresh. When all the stones are removed, the fistula usually soon closes with a simple covering bandage; and the scarring may be promoted by careful touching with lunar caustic, and suitable pressure. At the same time such remedies must be employed as will diminish the disposition of the bile to concrete, and will assist nutrition.

C.—OF FÆCULAR FISTULA.

(*Fistula Stercorea*, Lat.; *Kothfistel*, Germ.; *Fistule Stercoraire, Anus contre nature*, Fr.)

Sabatier, Mémoires sur les Anus contre nature; in Mémoires de l'Académie de Chirurg., vol. v. p. 592.

Desault, Œuvres Chirurgicales, vol. iii. p. 352.

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Reisinger, F., Anzeige einer vom Prof. Dupuytren zu Paris erfandenen und mit gluchlichsten Erfolge ausgeführten Operationsweise zur Heilung des Anus artificialis, nebst Bemerkungen. Augsburg, 1817. 8vo. With a copper-plate.

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Dupuytren, Mémoire sur une Méthode Nouvelle pour traiter les Anus accidentales. lu à l'Académie Royale des Sciences, en Janvier, 1824; in Mém. de l'Acad. Roy. de Méd., vol. i. Paris. 4to. Also De l'Anus contre nature, des dispositions anatomiques des effets, du siége du prognostic, du diagnostic et du traitement; in Leçons Orales de Clinique Chirurgicale, vol. ii. p. 193.

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Hennen, John, Principles of Military Surgery. Third Edition. London, 1830. 8vo.

Lawrence, William, A Treatise on Ruptures. Fifth Edition. London, 1838.

Teale, T. P., Article *Intestinal Fistula;* in Cyclopædia of Practical Surgery, vol. ii. p. 191. London, 1841.

[Gross, S. D., Experimental and Critical Inquiry into the Nature and Treatment of wounds of the Intestines. Louisville, 1843.—G. W. N.]

914. *Fæcular Fistula* is an old opening communicating with the cavity of the intestine, which, according to its size, discharges either only a part of the fæcal matter, whilst the rest passes by the natural passage, or by which all the excrement passes, and then the disease is called an *unnatural* or *artificial anus* (*Anus præternaturalis*, *artificialis*). The external opening is mostly round, contracted, and surrounded with radiated creases of skin; its edges are red and irritable; frequently there are several external openings leading to one canal: for the most part, the skin is firmly attached to the muscles, it is rarely degenerated, raised from the muscles, and forming a canal; the ends of the bowels are frequently connected directly with the *peritoneum;* frequently they are retracted, and the *peritoneum* forms a funnel-like elongation.

915. The effects of the fæcular fistula, and in a more advanced degree of the artificial *anus*, upon the whole organism, is very decided. By the escape of the chyle, which passes only through a part of the intestinal canal, is the nourishment lessened, though the appetite be great, and the patient quickly wastes, especially at first. The nearer the artificial *anus* is to the stomach, the more severe are these symptoms. If it be further down, at the lower end of the *ileum* or in the *colon*, more decided stools are passed, and the nourishment is not so much affected. By the continuance of the out-flow, the parts excoriate and become very painful. The mucous membrane of the intestine exposed to the air becomes redder, and less villous, but does not cease to secrete a large quantity of *mucus*. In artificial anus merely mucous fluid of a white colour, and varying consistence, which is secreted from the large intestines, passes through the *rectum*. The lower part of the intestinal canal gradually contracts together, but retains its permeability. Begin (*a*) has, however, observed an almost complete closing and wasting of the lower portion of the intestines.

[Astley Cooper (*b*) mentions the case of a man "with a strangulated umbilical hernia, which sloughed, and occasioned an artificial *anus*. As he was recovering from the effects of the strangulation and sloughing, and was allowed to take food in any considerable quantity, it was observed that part of what solids he ate passed out at the artificial *anus* within half an hour after he had swallowed them, and that fluids passed out in ten minutes after they had been taken into the stomach. Although he took sufficient food to support a healthy person, he wasted rapidly, and died in three weeks. On examining his body after death, and tracing the *jejunum*, the lower part of that intestine was found entering the hernial sac, and in it the opening was situated," (p. 52)].

916. Not unfrequently a prolapse of the intestine is produced suddenly in artificial *anus*, as a consequence of straining, or gradually by ensheathing, which often attains considerable size (nine inches and more). It occurs mostly only at one end of the intestine, has usually a more or less conical form, is contracted at the base, and its point has an opening through which the stools escape. The protruded part has a red colour, is well moistened with *mucus*, and usually is not very sensitive; frequently a peristaltic motion is observed, as in the intestines, and at first it is so contractile that the slightest touch causes retraction; it increases with straining, and diminishes or entirely recedes in the horizontal posture, or with sufficient pressure. The constant irritation to which it is

(*a*) Dupuytren, Leçons Orales, p. 211.
(*b*) Lectures on Surgery, vol. iii. Tyrrel's Edit.

exposed, thickens and renders it like the external tegument; it even becomes blackish. The protrusion may form adhesions with the opening from which it projects, and may even become strangulated. If the protrusion be of the lower end of the intestine, there escapes from it only a white, mucus-like fluid; but the stools pass out from the side of its base. If both upper and lower part of the intestine protrude at once, there are two projections, and the stools are discharged from the middle of the upper end of the intestines. From this protrusion often arise very painful draggings in the belly, which prevent the patient keeping himself upright, and compel him to bend the upper part of his body almost horizontally forwards. In this complication of artificial *anus*, the symptoms are always more severe, digestion is highly affected, wasting makes quick progress, and leads to *marasmus*, if the local relations of the parts be not changed.

917. Fæcular fistula and artificial *anus* may be the consequence of penetrating wounds of the belly, accompanied with injury of the intestine or with a protrusion which runs on to gangrene, also of gangrenous ruptures, of abscesses, of foreign bodies in the intestinal canal, and so on, by which either only one part of the wall of an intestine, or an entire coil of intestine is destroyed, in which case adhesion with the *peritoneum* takes place, at the circumference of the destroyed gut, and the effusion of stools into the cavity of the belly is prevented.

[Teale gives in his essay a very good tabular account of cases of artificial *anus* resulting from these various causes].

918. Upon the different position and state of the upper and lower portions of the intestine in artificial *anus* depends, whether the cure can be effected merely by the natural powers, or by the simultaneous assistance of art, or only by the intervention of an operation. The destroyed intestine, together with the corresponding part of the *peritoneum*, to which it adheres, retracts into the belly, where it forms a funnel-like cavity, which, in proportion as it enlarges, directs the passage of the stools from the upper end of the intestine into the lower. This, however, cannot happen in artificial *anus*, which forms after penetrating wounds of the belly, after old umbilical and ventral ruptures, when either the injured gut heals up with the edges of the outer wound, or the hernial sac becomes firmly adherent with the *aponeurosis* and abdominal coverings, and the extensible cellular tissue, which surrounds it in other ruptures, is deficient, consequently the adherent piece of intestine cannot retract into the belly sufficiently to form the funnel-like cavity by which the communication of the two ends of the intestine is produced. The cure of artificial anus in this way most readily occurs, when only part of the wall of the intestine is destroyed; but when both ends of the gut, between which a coil has been destroyed, are so connected and held by the mesentery, that they lie more or less parallel, and form an acute angle, a *projecting partition* is thereby formed which prevents the communication between the upper and lower ends of the intestine. If the projection of this partition cannot be removed by the retraction of the pieces of the bowel, the restoration of the natural passage of the stools is possible by destroying this partition.

The retraction of the piece of intestine specially depends on the movements of the

bowel and dragging of the mesentery, which, stretched like a cord from the back of the partition projecting between the openings of both portions of intestine to the spine, is always striving to retract the piece of adherent bowel. Thus is easily seen the effect which the recumbent posture and motion have upon the cure of artificial *anus*. Dupuytren (*a*) had two cases in which, by this dragging, the adhesions of the intestinal portions were torn through, and effusion of fæculent matter into the cavity of the belly caused. Examination after death of persons who have died of other diseases many years after the cure of artificial *anus* either by nature or art, shows the intestine either connected by a fibro-cellular band with the place of the artificial *anus*, or these connexions destroyed and the intestine floating freely in the cavity of the belly. In a case of artificial *anus* at the femoral ring, in a woman, which withstood the usual remedies, a spontaneous cure took place during pregnancy, (Wedemeyer), which Dupuytren attributes to the gradual retraction of the intestine from the external opening and the lengthening of the funnel-like cavity.

[Lallemand (*b*) had the opportunity of examining an intestine seven years after performing Dupuytren's operation for artificial *anus* upon it; and of which the external scar in the skin had twice given way after violent exertion, discharging fetid pus mingled with gas and fæcal matter, but subsequently closed. He gives the following account of the appearances he met with:—"There was found in the left inguinal region an oblique fistulous opening leading into the canal, of the size of a crow-quill. Round this, to the extent of five or six lines, was a thin shining cicatrix, in which wrinkled folds of the surrounding integuments terminated. A portion of *ileum*, not differing from the usual appearance of the intestines, was adherent to the left inguinal region by two slender columns. One of these, four lines long by two in width, contained the canal of communication between the fistula and the cavity of the intestine. This canal passed through the inguinal ring, which was short and nearly direct. The other was an ordinary slender fibrous adhesion. There were several ulcerations of the mucous membrane towards the ileo-cæcal valve. As soon as the fistulous communication had passed through the ring, it began to enlarge and assume the funnel-shape, and was quickly lost in the cavity of the intestine. When the latter, which presented the usual circular figure was laid open, a slight prominence marked the situation which had been occupied by the edge: the mucous membrane was just the same here as elsewhere."

Dupuytren (*c*) himself also states that on examining the bodies of many persons who had been subject to artificial *anus*, but died years after of other diseases, instead of finding the intestine fixed to the wall of the belly, he saw it free and floating in the cavity. "I should," says he, "have fancied I had been mistaken, had not the patient's identity been indisputable, and had I not discovered a fibrous cord stretched from the point of the abdominal wall corresponding with the accidental *anus* up to the intestine. This cord, some lines in diameter and some inches in length, larger at its extremities than in its middle, covered with *peritoneum* and entirely formed of cellular and fibrous tissue, without any cavity, was evidently the progressive elongation of the cellular tissue which had united the intestine to the wall of the belly, and the cause of this lengthening could only be the constant dragging of the intestine by the mesentery, in the different motions of the body during life." (p. 208).

The following account of the dissection of a case of artificial *anus*, after mortified strangulated rupture, given by Scarpa (*d*), explains the formation of the funnel:—"I found," says he, "that the great sac of the *peritoneum* had not only become firmly adherent to the portion of the intestinal tube, which had been unaffected by the gangrene behind the inguinal ring, and, properly speaking, in the cavity of the *abdomen*, but likewise that this sac of the *peritoneum*, like a membranous funnel, (*imbuto membranoso*), extended from the cavity of the *abdomen*, through the inguinal canal, into the fistulous tube communicating externally by a narrow hole in the groin. * * * Having divided longitudinally the narrow fistulous canal, and the membranous funnel, I saw distinctly that the two orifices of the intestine had remained parallel, without being at all turned towards each other; and the ridge (*pro-*

(*a*) Leçons Orales.

(*b*) Répertoire général d'Anat. et de Physiol. Patholog., vol. vii. p. 133.

(*c*) Leçons Orales.

(*d*) Sull' Ernie, Mem. iv. sect. iv.—I have to acknowledge making use of Lawrence's translations (from his work on Ruptures) of this portion of Scarpa as well as that from Lallemand.—J. F. S.

montorio) projected between them, which would have been sufficient of itself to prevent the direct passage of the *fæces* from the superior to the inferior orifice. The alimentary matters must therefore have been poured from the upper end into the membranous funnel, and have passed thence, by a half circle, into the lower end of the intestine." Upon the same point DUPUYTREN observes:—"In examining the opening of the skin and the bottom of the artificial *anus*, a sort of funnel is discovered, the dispositions of which have been best observed and described by the celebrated SCARPA. It is formed of parts, which inflammation and contact have reduced to the same nature, to wit, that of mucous membrane. Its point is at the skin, its base at the intestine; its length, direction, form, and dimensions vary to infinity, and have the greatest influence on the cure of the complaint. The greater its extent and capacity, the greater disposition, in general, has nature to cure this ailment, or to second the efforts of art for that purpose. At the bottom of the funnel are found the most remarkable and important circumstances relating to the artificial *anus*. There are the orifices of the two ends of the intestinal canal, and there the partition by which they are separated. Of these two orifices, the one belongs to the upper part of the intestine, is always penetrated by the food and stercoral matter, is the most free and widest of the two. The other is the continuation of the lower end of the bowel, and as it does not receive either alimentary or stercoral matter, or only in very small quantities, it is usually narrow, contracted, and difficult to find. To these orifices succeed the extremities of the intestine, villous, and lined with mucosities within, smooth covered with *peritoneum*, and bathed in serosity without, buried in the belly, sometimes crossing, sometimes twisting about each other, sometimes running parallel, but most commonly separating from each other at an angle more or less acute; and they are lost by curving more and more in the circumvolutions of the intestinal canal. On examining the space between the two orifices, a projection, more or less distinctly angular is perceived, and more or less near the entrance of the funnel just mentioned. This projection, the so called spur (*éperon*) already perceived and pointed out by SAVIARD and MORAND, results from the application and union, at an acute angle, of the corresponding walls of the two parts of the intestine which abut in artificial *anus*. * * * After a time this spur does not divide the bottom of the funnel into which the two ends of the intestine open, into two equal parts. Continually pressed on by the matters which the upper end brings down, this fold yields to their pressure, and is gradually carried towards the lower end, upon which it advances more and more, till at last it covers its orifice with a sort of valve, which hermetically closes its entrance, and renders its discovery very difficult. Towards the intestinal cavity the spur has constantly a crescentic form, of which the angles directed from the concavity towards the convexity of the new curve of the intestine, are confounded with it, and gradually lost either in the walls of the organ or on the edges of the deepest part of the wound of the belly. On the abdominal surface it is seen doubled, and the two equal halves of which it consists separate and receive the *mesentery* in their interval." (pp. 202–5). "Thus," says LAWRENCE, "the two portions of the bowel lie near together, but are not adherent; they are separated by the ridge called by SCARPA *promontorio*, and by the French *éperon*. If we introduce a finger into each orifice, and bring the fingers together, they are separated merely by the sides of the two portions of intestine. When it is described that they are kept apart by an intervening partition, we must remember that there is nothing but the intervening tunics. We might pass an instrument from one end of the bowel into the other, and thus cause a direct communication between them by perforating their coats; but as the bowels are simply contiguous without adhering, we should make a double wound into the cavity of the abdomen." (p. 383)].

919. The *treatment* of fæcular fistula or artificial anus, consists at first merely in attention to the proper discharge of the stools, in covering the opening with a wad of lint, and the removal of all pressure from it; good nourishing food, and easy of digestion, should be given, and frequently clysters and gentle purgatives. If there be externally several fistulous passages, they must be slit up, the irritation and callosity removed by poulticing and cleanliness of the dressings, and hard, tough, dry callosities, which will not disperse, are to be removed with the

knife. If the opening contract too quickly, or the stools cannot escape sufficiently, the opening must be enlarged with sponge-tent or the knife, which, however, is less safe, as the adhesions of the intestine may be easily divided. A sufficiently large pad should be put into the opening to prevent it narrowing; and its introduction is also the only mode of preventing the protrusion of the bowel. If this occur, attempts must be made to return it, and if that be not at once possible, we must try to effect it by continued pressure with a bandage. The patient must be kept in bed, and avoid all exertion. In strangulated protrusion, the stricture must be carefully divided at the root of the protruded part. If under this treatment the excrements be gradually discharged by the natural passage, and so continue for some time, the opening may be allowed to close, gradually, except the patient feels pain in the belly, or uneasiness from collection of stools; it is, however, advisable to keep up a small opening for some time longer by the introduction of a bougie. If the opening close too quickly, or if the stools collect largely at the opening of communication of both ends of the intestine, severe pain occur at the region of the artificial *anus*, painful distension of the belly, vomiting, and even bursting of the distended bowel, and effusion of fæcal matter into the cavity of the belly. In this case, if the opening be not yet entirely closed, an elastic tube must be introduced, through it into the upper portion of the intestine, or escape must be afforded to the collected excrement by a sponge-tent or by incision.

[I have had but one case of artificial *anus*, and that in a boy of about ten years old, and at the navel, the middle of the scar in which projected a little beyond the surface and was perforated by a small hole of sufficient size only to admit a probe. Through this hole a very small quantity of dark-coloured fæculent matter daily escaped, and its acridity kept the edge of the aperture constantly sore. Neither how this had originated (though probably from absess in the navel) nor how long it had existed can I state, having mislaid my notes; but the child was in tolerable health, though not very stout. Various means were tried without success to induce the hole to heal, among which attempting to form a scab with chalk and calamine powder, and the use of a pad and pressure. It was, however, finally cured by tying a ligature around it as low into the hollow of the navel as it could be depressed. This separated without any inconvenience, the wound healed and the fistula was cured.

King (*a*) considers that similar cases (of which he gives two) with that I have just mentioned, depend on a communication with the *diverticulum ilei*, and founds his opinion on the analogy which exists between the umbilical vesicle of the human subject and the yolk sac of the chick *in ovo;* in the latter of which "omphalo-mesenteric vessels communicate between the yolk sac and mesentery; and there is also a trace of a tube, on the plan of a *diverticulum*, opening into the intestine." (p. 467). The correctness of this view was fully confirmed by examination after death of the first case he relates, of this umbilical fistula which had been cured by making the edges raw and pinning them together. On examination, "a *diverticulum*, about three inches long, was found adhering to the *umbilicus;* and an adventitious cord appears to have compressed the *ileum*, just below its connexion with the *diverticulum*." (p. 472).

I have also seen another case of aperture, in the navel of a woman about twenty-five years old, from which there was a constant flow of colourless fluid, and free from smell, in such quantity as to wet a napkin through one or twice a-day. Whence this fluid came I cannot determine, it could scarcely have been from an intestine; I once thought it might have been obtained from the bladder by passing through an *urachus*, but it had not any urinary character. She had been subject to

(*a*) On a Fæculent Discharge at the *Umbilicus* from communication with the *diverticulum ilei;* in Guy's Hospital Reports, Second Series, vol. 1. 1843.

it for years, but her health was not at all affected and she was only inconvenienced by it.—J. F. S.

In concluding this review of DUPUYTREN's operation for artificial *anus*, LAWRENCE observes:—"Cases of artificial anus must be much more numerous in Paris than in London. DUPUYTREN employed his method in between twenty and thirty instances within a short time. No opportunity has occurred to me of putting it into practice, either at St. Bartholomew's Hospital or elsewhere for several years; and I believe that it is hardly been employed at all in this country." (p. 415)].

920. If with this treatment the cure of the artificial *anus* be not possible, because the partition between the two openings of the intestine projects too much, the partition must be cut off with the *intestinal scissors* (*enterotome*) invented by DUPUYTREN. For this purpose the position of both ends of the gut are to be most carefully ascertained with a thick sound oiled, or with the finger; to do which, previous enlargement of the external wound with sponge-tent is often necessary. The fleshy growths, which, however, must be carefully distinguished from the intestinal protrusion are to be removed with caustic, ligature, or scissors. Finding the two openings of the intestine is often attended with much difficulty, because the partition is always pressed against the opening of the lower part by the stools flowing down from the upper, and the former is at last completely closed. The more readily the openings of both portions of the intestine are found at the bottom of the artificial *anus*, the more favourable is the *prognosis*. If thick probes (female catheters) be used for examination, they must be connected externally together after their introduction into the upper and lower end of the intestine, and turned upon their axes, which movement is opposed by the partition. When the ends of the intestine are discovered, the arms of the intestinal scissors should be so introduced into both ends of the gut upon the finger, or on the hollow sound, that when closed at least two and a-half inches of the partition shall be taken hold of. The same turn is to be made with the introduced arms of the scissors as with the sounds, to ascertain that they have entered completely. By the screw on the handle of the scissors, they are to be closed only sufficiently to produce a *little pain;* the handle of the forceps is to be wrapped in linen and fastened to a **T**-bandage. Every day, or every two days, the forceps are to be screwed a little tighter. If little pain follow it is well, but if severe the forceps must be loosened. The patient must take light nourishment, and soothing clysters may be given. Against pain in the belly, oily mixtures, soothing clysters, and applications are to be used, and inflammatory symptoms, the proper antiphlogistic remedies. According to DUPUYTREN's observations, however, these symptoms rarely occur.

DUPUYTREN's first intestinal scissors crossed each other with a disjoinable lock; but SEILER has modified them by making the arms parallel (*a*).

LIORDAT's *emporte-pièce*, for the purpose of removing a larger piece of the partition (*b*).

REYBARD (*c*) seizes the partition between the upper and lower end of the intestine with forceps, and divides it by pushing forward his enterotome. The forceps, are left attached to produce the union of the corresponding wounds of the intestine.

DELPECH's enterotome (*d*) differs from that of DUPUYTREN in each of its branches, being a little curved, and ending in an oval plate an inch in length. When intro-

(*a*) SEILER, above cited, pl. vi. f. 14.
(*b*) Above cited.
(*c*) Above cited.
(*d*) FRORIEP's Notizen, No. 583. p. 169.—Chirurgische Kupfertafeln, pl. cclxviii.

duced and brought together by the screw, in consequence of the curved form of the branches, such portion only of the intestinal partition is compressed as is enclosed between the two plates. The object is to destroy a smaller portion of the partition at one time, and to repeat the process until a sufficient opening shall be made in it. The form of the opening, DELPECH also holds to be preferable to the lengthened slit made by DUPUYTREN's instrument (*a*).

DESAULT was aware of the partition between the two ends of the intestine preventing the passage of the excrement, and endeavoured to retract and diminish the protrusion, partly by closing the external opening with a plug, partly by the introduction of long rolls of charpie into the two ends of the gut, which he gradually brought straight, pressed back, and diminished. With the same object SCHMALKALDEN, (*b*) made an opening into the projecting partition, which he endeavoured to preserve by introducing tents, and by careful notching, to increase and establish the natural passage for the excrement.

[Our American brethern seem disconcerted at the invention of this mode of treatment being generally assigned to DUPUYTREN. After referring to DESAULT's practice just mentioned, Dr. GIBSON (*c*) observes:—"A more expeditious and less troublesome operation was proposed and successfully executed by Dr. PHYSICK between the years 1808 and 1809. * * * An operation similar to that of Dr. PHYSICK was afterwards performed by DUPUYTREN in Paris, and to him the merit of the proposal is awarded by European writers without the slightest foundation." (p. 316.) Now certainly, though our French neighbours are occasionally not particular in claiming that to which they are not strictly entitled, yet in the present instance, whatever may have been awarded to DUPUYTREN, he himself mentions in a note to his Memoir, SCHMALKALDEN's dissertation, though without giving particulars, and also specially quotes Dr. PHYSICK's plan of treatment from DORSEY's Elements of Surgery, vol. ii. p. 67. He is therefore, so far at least as Dr. PHYSICK is concerned, entirely free from misappropriation. It cannot, however, be denied that PHYSICK's account is merely the recital of a case and of a novel operation for its relief, without entering into the consideration of the nature and circumstances of artificial *anus*, to which first SCARPA and subsequently DUPUYTREN have paid especial attention, and of which they have given very excellent account. PHYSICK's operation is, however, well worthy of being better known, and it is therefore here given from Dr. B. H. COATES's report (*d*):—

"The two ends of the intestines," says COATES, "were found, by careful examination, to adhere to each other for some distance, and the form thus presented has been compared in this case to that of a double-barelled gun. The next method proposed by Dr. PHYSICK, was to cut a lateral opening through the sides of the intestines when they were adherent. But not knowing the extent of the adhesion inwards, he thought it necessary to adopt some preliminary measures for ensuring its existence to such a depth as might admit of the contemplated lateral opening, without penetrating the cavity of the *peritoneum*. By introducing his finger into the intestine through one orifice, and his thumb through the other, he was enabled to satisfy himself that nothing intervened between them but the sides of the bowels. He was thus enabled, without risk, to pass a needle, covered with a ligature, from one portion of the intestine into the other, through the sides which were in contact, about an inch within the orifices, which ligature was then secured with a slip knot. This operation was performed on the 28th January, 1809. The ligature was nearly drawn sufficiently tight to ensure the contact of those parts of the peritoneal tunic, which were within the noose. When drawn tighter, it produced so much pain in the upper part of the *abdomen*, of a kind resembling colic, that it became necessary immediately to loosen it. The ligature in this situation, gradually made its way by ulceration through the parts which it embraced, and thus loosened itself. It was at several periods again drawn to its original tightness. After about three weeks had elapsed, concluding that the required union between the two folds of *peritoneum*

(*a*) [An ingenious instrument for the cure of Artificial Anus, has been described by LOTZ in the Amer. Journ. of Med. Sci. vol. xviii. 1836.—G. W. N.]

(*b*) Above cited.

(*c*) Institutes and Practice of Surgery, vol. ii. Philadelphia, 1827.

(*d*) Account of a Case in which a new and peculiar operation for Artificial Anus was performed in 1809 by PHILIP SYNG PHYSICK, M.D., then Professor of Surgery in the University of Pennsylvania. Drawn up for publication in North American Med. and Surg. Journal, vol. ii. p. 269.

was sufficiently ensured, Dr. Physick divided with a bistoury all the parts which now remained included within the noose of the ligature. No unfavourable symptom occurred in consequence. On the 28th February, the patient complained of an uneasy sensation in the lower part of the *abdomen*, and on the 1st of March he extracted with his own fingers some portions of hardened *fæces* from his *rectum*. On the 2d March two or three evacuations were produced in this manner. On the 3d an enema, consisting of a solution of common salt, was directed to be given twice every day. The first of these occasioned a natural stool, about two hours after its administration. The same effect was produced on the 4th, 5th, and 6th, and the discharges from the orifices in the groin now became inconsiderable. Adhesive plasters, aided by compresses, were employed, not only to prevent the discharge of *fæces* from the artificial opening, but with the additional object of procuring the adhesion of the sides. This last effort was unsuccessful. On the 24th June, an attempt was made to unite them by the twisted suture. Pins were left in for three days, and adhesion was in fact effected; but owing to the induration of the adjacent parts, the wound again opened. On the 27th July, a truss of the common construction, furnished with a very large pad, and surmounted by a large compress, was applied to the wound. By these means the discharge of *fæces* from the groin was completely prevented, and the patient had regular evacuations *per anum*, except when from improper diet or cold, he became affected with *diarrhœa*. At such times, a small portion of the mere fluid matter escaped by the sides of the compress. Not satisfied with this state of things, Dr. Physick made several attempts to improve the patient's condition. On the 2d August, a mould of the parts was taken in plaster of Paris, and being covered with buckskin, was employed as a pad for the truss. This expedient answered extremely well, as long as the patient continued in the same posture in which the mould was made; but as soon as the form of the parts was altered by a change of position, *fæces* escaped from the orifice. A bandage was then applied to the body, furnished with a thick compress, and having that part of it which crossed the patient's back formed of elastic extensible wire-springs, such as are used in braces. This also, however, proved ineffectual. The truss, with a compress and a large pad stuffed in the common way, was then reapplied, and found to answer completely the purpose of preventing the discharge of *fæces*, the hope of an entire closure of the orifice being abandoned. On the 10th of November he was discharged from the hospital in good health and spirits, and applied himself, with very good success, to acquire the profession of an engraver." (pp. 271–72.)]

921. When the intestinal scissors have divided the partition, which happens usually in from seven to ten days, and the separated part of the bowel is found between its arms, soothing clysters must be continued, and closing of the fistula only attempted, when the relief of the bowels has been effected for some time in the natural way, even without injections. The closing of the fistula (often the most difficult part of the whole treatment) may be effected by quiet, by a *moderate* compressing apparatus with variously-formed pads and elastic belly-band, by touching with lunar caustic, by pressing the edges of the fistula together with a peculiar compresser (*a*) invented by Dupuytren, by sticking plaster, by suture, or by the removal of the whole circle of mucous membrane preventing adhesion at the mouth of the fistula, and even by detaching part of the external coverings above the opening, and laying it before it. In general a small fistulous opening remains for years, then only occasionally do a few drops of intestinal dirt escape, and afterwards it closes of itself. In those cases where artificial *anus* cannot be cured, various proposals have been made to catch the excrement. The most simple, and in most cases most suitable, is a belly-band, which, instead of a pad, is furnished with an ivory plate having an opening in its middle, and connected by

(*a*) Breschet, above cited, pl. iii. fig. 2.

means of a cylinder of elastic rosin, with a silver vessel, out of which the escape of the stools is prevented by a valve (*a*).

Dieffenbach (*b*) at last cured an artificial *anus* arising from a lance wound, which had withstood every plan of treatment, in the following manner:—He destroyed with the hot iron not only the edge of the intestine adhering to the opening, but also a considerable portion of the intestine within the belly, and in every cauterization the *peritoneum* participated. This burning was free from pain. He first burned the edges of the intestine; some days after, he introduced a curved hot iron, of the thickness of a feather-stem, through the hole, into the cavity of the intestine and carried it round. The opening gradually became smaller; granulations sprung from within and by repeated burnings with smaller hooks, which he introduced to the extent of an inch about the inner edge of the opening, it diminished to the size of a small fistula. This also closed by the repeated introduction of a heated fine silver probe. The patient was perfectly restored after nine months.

922. If an unnatural anus communicate with the *cæcum*, and arises from ulceration, neither funnel-shaped lengthening of the *peritoneum*, nor projecting partition are produced, as after gangrene of a coil of intestine; and it is therefore more difficult to cure. Suture is useless. The skin has been detached about the opening, and brought together with some stitches, but equally without avail. Autoplasty has been attempted, but the laps have sloughed. The skin about the opening may be pared off, without the inner parts being touched, so that the escape of fæculent matter may be prevented, and that the dragging of the threads may be better borne; otherwise, for the purpose of rendering the tearing and dragging less, semi-circular cuts may be made in the skin, of which the concavities should be directed towards the unnatural anal opening, upon which, when the operation is finished, slight pressure may be made by graduated compresses. Velpeau (*c*) also proposes the introduction of a tube of gum elastic, provided with several holes, through which waxed threads are to be carried, from within outwards, through the previously pared edges of the opening. When the aperture has scarred, the threads are to be cut through, and the tube being set free, passes by stool; a mode of treatment similar to that proposed by Reybard for the union of wounds of intestines (*par.* 525). Perhaps Dieffenbach's above-mentioned burnings may be applicable to such cases of artificial *anus*.

D.—OF RECTAL FISTULA.

(*Fistula Ani*, Lat.; *Mastdarmfistel*, Germ.; *Fistule à l'Anus*, Fr.)

Pott, Treatise on Fistula in Ano; in his works by Earle, vol.
Desault, Œuvres Chirurgicales, vol. iii. p. 380.
Detzmann, Dissert. de fistula ani. Jenæ, 1812. 4to.; with plates.
Reisinger, F., Darstellung eines Verfahrens, die Mastdarmfistel zu unterbinden. Augsburg, 1816. 8vo.
Kothe, Darstellung und Würdijung der Kurmethoden der Afterfisteln; in Rust's Magazin, vol. i. pt. ii. p. 259.
Schreger, Ueber die Unterbindung der Mastdarmfisteln; in his chirurgische Versuchen. Nürnberg, 1818. vol. ii. pt. i.

(*a*) Collier, in Fothergill's Medical and Physical Journal, 1820, June.
(*b*) Casper's Wochenscrift, für die ges. Heilk., 1834, p 265.
(*c*) Memoire sur l'Anus contre nature dépourvu d'éperon, et sur une nouvelle manière de le traiter. Paris, 1836.

Copeland, Thomas, Observations on the principal Diseases of the Rectum and Anus. London, 1814. 8vo.

Bell, Charles, A Treatise on the Diseases of the Urethra, Vesica Urinaria, Prostate, and Rectum. Third Edition; with Notes by Shaw. London, 1822. 8vo.

Brodie, Sir Benjamin, Lectures on Diseases of the Rectum; in Medical Gazette, vol. xviii. 1836.

[Bushe, George, A Treatise on the Malformations, Injuries, and Diseases of the Rectum and Anus. New York. 2 vols. 8vo.; with a 4to. vol. of plates.

Coates, R., Article *Anus*, in the American Cyclopædia of Practical Medicine and Surgery. Vol. ii. Philadelphia, 1836.—G. W. N.]

923. Under the term *Rectal Fistula* is comprehended every fistulous suppurating passage in the neighbourhood of the *rectum*, in which either merely the tissue surrounding the outer walls of that gut is destroyed, or the fistulous passage communicates with the cavity of the *rectum*. Rectal fistulas are therefore distinguished into the *perfect*, (*F. ani completæ*,) and *imperfect* (*F. ani incompletæ*,) according as they have an external and internal opening communicating with the cavity of the *rectum;* or they have an internal or external opening alone, *imperfect internal* (*external blind*) and *imperfect external* (*internal blind*) *rectal fistulas*. They also present numerous other differences; the fistulous canal may extend far up into the cavity, may be accompanied with many external openings, may extend far beneath the external skin, and be accompanied with callosities and hardening, with foreign bodies, with disease of the neighbouring parts, the bladder, *urethra*, *vagina*, and so on, or even with *caries* of the bones of the *pelvis*.

924. The causes of rectal fistulas, are injuries of the internal coat of the *rectum* by foreign bodies which pass with the stools, producing inflammation and suppuration, suppurating bunches of hæmorrhoids, by which the internal membrane of the *rectum* is destroyed. These fistulas generally form slowly; the patient has for a long time itching at the *anus*, and a knobby swelling forms about it, which often merely empties itself by a small opening, or the fistula has little disposition to break externally, but rather spreads upwards, and may be connected above by a second opening with the *rectum* (*a*); or an abscess may form about the *anus* from hardening, from injury, from burrowing of pus from another part, which deprives the exterior wall of the *rectum* more or less completely of its cellular tissue. These abscesses are often critical, and the patient is thereby freed from other complaints, from affections of the chest and so on; often they are merely consequent on gorging of the hæmorrhoidal vessels, from diseases of the breast and liver.

925. The condition of the fistula is in part shown by the nature of its origin, the fæcal or merely purulent discharge, and the passage of intestinal gas from it, especially after examination with the probe.

926. According to the observations of Sabatier, Larrey (*b*), and Ribes (*c*), the internal opening of rectal fistula is most commonly found

(*a*) Schreger, Annalen des chirurgischen Clinicum's auf der Universität zu Erlangen, 1817, p. 92.

(*b*) Mémoires de Chirurgie Militaire, vol. iii. p. 415.

(*c*) Recherches sur la situation de l'Orifice interne de la Fistule à l'Anus et sur les parties dans l'épaisseur desquelles ces ulcères ont leur siége; in Révue Médicale Historique et Philosophique. Paris, 1820, livr. i. p. 174.

immediately above the part where the internal membrane of the *rectum* joins the external skin, rarely about, but never higher than five or six lines; at least such was the case in seventy-five corpses in which Ribes examined rectal fistulas.

[Astley Cooper mentions a case of fistula which had a very remarkable course: —"A man died of a discharge from a sinus in the groin, having also a *fistula in ano*; and upon tracing the sinus in the groin, it passed under Poupart's ligament, and taking the course of the *vas deferens*, descended into the *fistula in ano*." (p. 326.)]

927. These observations, which agree with my own experience, must assist the surgeon in the examination of rectal fistulas. A thickish probe should be introduced horizontally and nearly parallel with the *perinæum* at least in women, because in them the opening of the *rectum* is less drawn in, than in the male, in whom the probe must be directed rather more upwards. The probe should be introduced into the canal of the fistula, and without leaving it, carried, toward the lower end of the *rectum*, where sometimes the opening is found, and the probe may be felt penetrating into the gut by the fore-finger therein introduced. In many cases when the patient protrudes the *rectum*, and the edges are drawn aside with the fingers, the internal opening of the fistula may be seen. If the examination be not thus proceeded with, the internal opening must be sought at the bottom of the fistula; the wall of the *rectum* may be easily penetrated. If several external fistulous orifices be present, they all must be examined in order to determine whether they be connected with each other. The examination must be repeatedly made whilst the patient is on his side, with the trunk bent forwards, upon his back with the thighs drawn up, and whilst standing. Catgut bougies and injections may also be employed for the close examination of the state of the fistula. In the examination of incomplete internal fistula, those parts at which the patient has always specially felt pain, or which are indicated by softness, hardness, or laxness, must be carefully examined, partly with the finger and partly with the probe, which should not be hook-like and curved, but straight, as the canal of the fistula often stretches upwards (*a*) (*par.* 924). The part, which about the *anus* is harder and painful to the touch, shows the bottom of the external blind fistula. The colour of the skin is here usually changed, and on pressure pus flows into the *rectum*. These symptoms, however, are often wanting, and the patient merely feels pain.

928. The cure of the rectal fistula which has an internal opening, is only to be effected by division of the *sphincter* muscle, and the partition between the fistulous passage and the gut. If the canal of the fistula extend far up, a relapse is more certainly prevented by beginning the division from the external opening. Many observations support this, and there is the proof that the most important part of the operation for rectal fistula consists in the division of the *sphincter* muscle, whereby the collection of fæcal matter in the *rectum* is prevented, and the union of the walls of the fistula possible. An imperfect external rectal fistula does not always require this division of the partition, because if in such case due care be taken for the proper escape of the *pus*, the stripping of the *rectum* is not so considerable as to render doubtful the connexion

(*a*) Schreger, above cited, p. 98

of the walls of the fistula with the neighbouring parts. The operation for rectal fistula must be considered to be contra-indicated, when it seems to be a vicariously secreting organ, by which other ailments are lessened or removed, (here the annoyance of the patient may be relieved by enlarging the external opening of the fistula, and by cleanliness, and the cure must be proceeded in at least not without careful preparation, according to the circumstances of the patient,) and if it be connected with other diseases of the pelvic bones, of the bladder, of the prostate gland, of the *vagina* and so on, or with *phthisis*, or incurable disease of the liver, which cannot be removed by the operation for fistula. Those rectal fistulas are to be considered incurable which are very old, have many openings, are connected with ruptures and callosities, where too much must be done to destroy them, and where the internal opening is out of reach. If the fistula have existed a long while, the operation must not be undertaken without the introduction of issues ; and also if the fistula and the neighbouring parts be much swollen and inflamed, the operation must be withheld till these symptoms are put aside.

[The following observations of Brodie should always be borne in mind when considering the propriety of operating for fistula:—"In those cases in which a *fistula in ano* occurs in connexion with some organic disease of the lungs, or liver, I advise you never to undertake the cure of the fistula. No good can arise from an operation under these circumstances; but if you perform it one of two things will happen: either the sinus, although laid open, will never heal, or, otherwise, it will heal as usual, and the visceral disease, will make more rapid progress afterwards, and the patient will die sooner than he would have done if he had never fallen into your hands." (p. 186.) And Astley Cooper also observes :—"The surgeon often brings discredit upon himself by operating in these cases, in the last stage of *phthisis*, when no operation ought to be performed, and when it is impossible that the disease can be cured: therefore that death which is the result of pulmonary disease, is falsely attributed to the *fistula in ano*." (p. 328.)]

929. The abscesses which form in the neighbourhood of the *rectum* are either phlegmonous, defined and accompanied with throbbing pain, or they arise gradually in form of little not very painful knobs, or they occur after the protrusion of the *rectum*, with simultaneous collection of fæcal matter and pus, are of great extent and commonly produce, especially with persons of bad constitutions, wasting suppuration and gangrenous destruction. In the former case leeches and soothing applications are to be employed, and the abscess should be opened early with the lancet, to prevent the destruction of the cellular tissue in the neighbourhood of the gut; and if the canal do not communicate with the gut, it may be hoped that simply by the covering bandage and the use of soothing applications, or in old fistulas of this kind, by injections exciting inflammation, the cure may be effected. In hard and little painful swellings, soothing poultices and dissolving plasters may be used ; they should be opened when soft and the further treatment be such as in the former case. But if in internal blind fistula the outer wall of the *rectum* be exposed to some extent, the division of the partition between the fistulous passage and the gut is requisite. When a large abscess has formed about the *anus*, if it have arisen from tearing of the wall of the *rectum*, a sufficiently large opening (but not a transverse cut, which would at the same time divide the wall of the gut) must be made, attention paid to the free escape of the *pus*, to the necessary means for supporting

the powers, and afterwards when the fistulous passage has become more contracted, the division of the partition between the fistula and *rectum* must be proceeded with. (SABATIER) (*a*).

"In speaking of large abscesses which sometimes form high up by the side of the *rectum* and above the *sphincter* muscle, BRODIE makes the following excellent observations:—"When the existence of such an abscess is ascertained, you ought without delay to puncture it; otherwise not only will the patient have to undergo a great deal of unnecessary pain, but the abscess will extend itself in the *pelvis* until it attains an enormous size. You must ascertain the situation of the abscess, by observing to what part the pain is referred, and by examining the *rectum* with the finger. Then introduce a lancet through the external skin by the side of the *anus*, in the direction of the abscess, until the matter flows. Frequently the abscess is at such a depth that the lancet does not reach it until nearly the whole of the blade has penetrated the soft parts; and sometimes an ordinary lancet is scarcely of sufficient length to accomplish what is wanted. You are then to introduce a probe-pointed bistoury through the opening thus made, and divide the *rectum* at the lower part of the abscess, carrying the incision downwards, so as to include the *sphincter ani* muscle, as you would in an ordinary case of fistula. These incisions make a free opening into the abscess, which is immediately emptied of its contents. The wound is then to be dressed in the ordinary way, and nothing more is wanted. It is quite unnecessary, in these cases, to lay the whole abscess open into the *rectum*; the free division of it at the lower part is sufficient; and if the incision were to extend further, it might give rise to a dangerous hæmorrhage from large blood-vessels beyond the reach of the finger. I have met with abscesses, such as I have now described, containing from half a pint to a pint of matter. I have had no opportunities of dissection so as to ascertain their exact locality; but from examinations made with the finger, after they have been opened, I am led to suspect that their usual situation is between the *levator ani* muscle and the *pelvis*, and that the division of the lower part of this muscle, as well as that of the whole of the *sphincter ani*, is necessary to the cure.

"These large *pelvic* abscesses occur in some instances as the original and only malady. In other cases, as I explained in my last lecture, they are the result of an abscess lower down, or a common fistula. I have met with several cases such as I am about to describe. I have been consulted concerning a fistula near the lower part of the *rectum*, which I have laid open in the usual manner. But, after some time, I have found that the parts showed no disposition to heal, or that they healed imperfectly, and that there was a discharge of pus much greater than could be accounted for from the apparent extent of the sore surface. I have thus been led to make a further examination; and at the upper part of the *sinus* which had been previously laid open, I have discovered a small orifice, through which a long probe might be passed to a great depth. I have laid open the lower part of this upper abscess into the *rectum*, and could then introduce my finger so as to feel the broad inner surface of the *pelvis* on one side, and what seemed to be the *levator ani*, on the other. After this second operation, the purulent discharge has immediately become much reduced in quantity, and in the course of a short time the patient's cure has been completed." (p. 186.)

930. The usual modes of operating on rectal fistulas are *incision* and *ligature*, as the early mode of treatment with the hot iron or caustic is now put aside, and *cutting out* the fistula must be confined to those cases in which it is connected with scirrhous or carcinomatous degeneration.

931. For the operation on the rectal fistula by cutting a quantity of instruments have been invented, as the syringotome, the curved bistoury, the special apparatus of DRUMMOND, RETTLER and BRAMBILLA, the fistula-knife of POTT, SAVIGNI, REMM, DZONDI, and others. But the most simple and certain proceeding is, when, for cutting the wall of the fistula only a *common straight bistoury*, a *grooved probe* without a blind

(*a*) Médecine. Opératoire. Nouv. Edit., 1822, vol. ii. p. 309.

point, and a *wooden gorget* are used. After having emptied the *rectum* with a clyster and removed the hair in the neighbourhood of the fistula, the patient is to be laid in his bed, or on a couch upon the side of the fistula, with the thigh of the affected side stretched out straight, and the other bent towards the pelvis. The grooved probe is to be introduced through the canal of the fistula and its internal opening into the *rectum*, where it is found by the finger which has been therein introduced. The oiled gorget is then to be passed into the *rectum*, its hollow directed towards the side of the fistula, and the probe pressed against it. The probe and gorget being felt to touch distinctly, are to be held with either hand, and moved together. The probe is given to an assistant, who at the same time separates the buttocks, and the gorget being pressed against it, a straight bistoury is to be introduced along its groove, till it reaches the gorget, and in drawing out the bistoury all the parts between the probe and the gorget are divided, which is shown by the probe and gorget being drawn out through the wound without disturbing their contact after the incision is completed. If the canal extend higher than the internal fistulous opening, a pair of blunt scissors should, according to the advice of some, be introduced into the wound, upon the forefinger, and the remaining partition divided. This, however, is according to foreign and home experience not indispensable (*par.* 928.) If the internal fistulous opening be very deep, a fine flexible, silver, hollow sound may be introduced by the fistula into the *rectum*, its end brought down out of the gut with the forefinger, and the parts lying upon it divided with a bistoury pushed along the groove.

Further observations on the seat of the internal opening in rectal fistula must decide, whether this be not always connected as above said, (*par.* 928,) and whether the division of the wall of the fistula from the inner opening be sufficient for the cure although the fistulous canal extend higher.

[My common practice in operating on rectal fistula, has been for years, to use a soft silver director which will bend. Having introduced the forefinger of one hand into the *rectum*, I pass the director through the fistulous passage, and if, as is generally the case, there be a hole in the gut, into the *rectum*, but if there be not an opening, or if it cannot be readily found, I bore the end of the director against the wall of the gut, upon the finger introduced, and thus speedily penetrate into the cavity of the *rectum*. Having thrust the end of the director well through, I bend it round with the top of my finger, till I have brought it through the *anus* externally, and then thrust it a little further, till its point rests upon the opposite buttock. Having both ends of the director, and both apertures of the fistula well in sight, I divide the *sphincter* and its tegument, by running a pointed curved bistoury along the groove of the director. I think this mode of proceeding is best, because it shows to what extent the parts are divided; and also that thereby the upper part of the wall of the fistula tears, and is therefore less likely to unite by adhesion, than when clean cut, as quick union is not desirable. Brodie also recommends the practice of bringing the end of the director through the *anus*, and dividing upon it.

If I do not bring the probe out, I prefer the old practice of cutting on the finger, which must be first introduced into the gut, then the fistula should be examined with a probe, and its direction and extent being ascertained, the probe is withdrawn, and a button-ended curved bistoury passed in its room, through the opening in the gut, if there be one, but if not, the bowel is to be rubbed between it and the finger till it make one; the end of the finger is then carried over the end of the knife, which being thus defended, the hand that holds the handle of the knife grasps the other, and the finger and knife are together drawn down, cutting through the *sphincter* as they are brought out. There are, however, two inconveniences as regards this operation, the surgeon may cut his finger severely, or break the knife in the fistula, which I have seen when the patient has been unsteady.—J. F. S.]

932. In an internal blind fistula, the director should be carried to its bottom, pressed against the gorget introduced into the *rectum* and the partition divided with the straight bistoury, as in the former case.

933. After the completion of the operation and after the wound has been properly cleaned, the fore-finger of the left hand should be introduced into the *rectum*, to the upper end of the wound, and then by means of a probe or pair of forceps well oiled, a tent of lint should be passed up and put lengthways between the edges of the wound, so as to prevent them touching; wad of charpie is then to be put on, to be fixed with sticking-plaster, then a compress, and the whole held together with a T-bandage. After the patient is put to bed in a convenient position upon his side, an opiate should be given, and the bandage is to be removed every time the bowels are relieved, (which should be every twenty-four hours), after that the *rectum* has been cleared with lukewarm water; with the remark that in the following dressings the tent is no longer to be oiled, is to be thinner and thrust in less deeply as the wound is lessened by granulation. The scarring is promoted by the careful application of lunar caustic.

The opinion of Pouteau and others, that after the operation of cutting a rectal fistula any dressing is unnecessary and injurious, which of late has found advocates in von Walther, Jaeger, and others, I cannot accede to, inasmuch as experience has only shown that without dressing, the edges of the divided partition readily in part unite, and the fistulous passage does not close. That kind of dressing in which the wound is completely filled with several tents, and one thick tent is introduced into the *rectum*, as Boyer, Sanson, Textor, I myself, and others have recommended, I consider as unsuitable, and have given it up for the above-mentioned more simple treatment. A. Cooper (*a*) put after the operation a dry tent in the wound, and on the following morning applied a soothing poultice; in two or three days the tent comes out, and a probe should be frequently introduced into the wound for the purpose of preventing the adhesion. Poultices are to be continued, and when granulations spring up the tent must be again introduced, and by this treatment much pain and severe inflammation and suppuration are prevented.

934. The accidents which may occur during and after the operation by cutting are severe bleeding, too much or too little inflammation, copious suppuration, colic, *diarrhœa*, retention of urine, and costiveness.

A severe bleeding, if the bleeding vessel cannot be tied, or if the bleeding cannot be stopped by the application of styptics, requires plugging, in which a firm wad of lint bound crossways with two strong threads must be introduced into the *rectum*, up to the bleeding vessel, and between them, as they hang down from the gut, sufficient lint is to be introduced to fill the *rectum*, and then the threads are to be tied upon it. In females the *vagina* must also be plugged (1).

Severe inflammation requires besides loosening or removing the bandages, cold applications, leeches, soothing applications, clysters, oily mixtures, and the like; copious suppuration needs a corresponding strengthening treatment; spasmodic colic, oily mixtures with opium, soothing clysters and warm applications; for retention of urine, the use of the catheter, warm applications to the region of the bladder, soothing remedies and clysters, which are also equally indicated in costiveness (2).

(*a*) Lectures on Surgery, vol. ii. p. 333.

[(1) Instances, though rare, have occurred of death from bleeding after the division of a rectal fistula, and I recollect seeing such a case very soon after I became a student, in which the patient died within twenty-four hours of the operation. Copeland objects very properly to the practice here advised of stuffing the *rectum* for the purpose of stopping the bleeding. "I have," says he, "so frequently seen the hæmorrhage kept up as long as this method of plugging the intestine was persevered in, and cease spontaneously when every kind of application was omitted, and the parts left for a short time exposed to the open air, together with a cool room, and avoiding all drink that hurries on the circulation, that I cannot help thinking that the irritation of the compresses keeps up the bleeding, and that the most eligible mode of treating it, when it is impossible to secure the vessel with a ligature, is to take off every kind of dressing, and to suffer the part, as much as possible, to be exposed to the external air. * * * I am persuaded, from repeated experience, that by being too busy with compresses, and styptics, and astringents, and such like applications, we most frequently only hide the bleeding and rather prolong its continuance, than otherwise. * * * After many unsuccessful attempts to secure a bleeding vessel under such circumstances, I once accomplished it by introducing a blunt gorget into the *rectum*; and by keeping the gut thus dilated, I was enabled to see the orifice of the bleeding artery and to secure it." (pp. 90–91).

(2) Brodie observes, that "in a very few cases *erysipelas* appears to extend up the mucous membrane of the *rectum* into the other parts of the intestine; and this is a most formidable disease indeed. The symptoms are very peculiar, and as far as I know, are not described by writers. The pulse becomes very rapid and at the same time weak; then it is irregular and intermitting; the *abdomen* is tympanitic in consequence of the intestines being distended with air; hiccough takes place; there is a great prostration of strength, and the patient often dies in the course of three or four days, sometimes sooner. * * * This internal erysipelas, however, is not necessarily fatal. I have known more than one case in which it manifestly occurred, but without the usual prostration of strength, and the patient recovered. When I have met with a case of this kind, I could never entertain a doubt as to the medical treatment which should be employed. It is sufficiently indicated by the symptoms; and for the most part, the great failure of the vital powers demands the free exhibition of cordials and stimulants." (pp. 185–86)].

935. The *ligature* of a rectal fistula (*Ligatura Fistulæ Ani*) consists in tying together the whole wall, separating the *rectum* from the fistula, with a thread which, by gradual tightening, cuts it through; in this case as the fistulous wall is divided, the part cut through, heals from above downwards. The proceeding in tying the rectal fistula varies according to its seat and condition. The best materials for the ligature are several hempen or silken threads put together, or a silken loop-shaped thread, and the silver or leaden thread recommended by many persons.

[Luke, of the London Hospital (*a*), during the course of the present year has advised the treatment of *fistula in ano*, by tying it with a thread, and says:—"The advantages of this method over that by the knife, are; *first*, the shorter period which usually elapses before the final cure; *second*, the less pain which is felt during the treatment; *third*, the absence of the dread which the knife generally inspires, and the consequent inducement which it offers to the patient to submit to effective curative treatment; and *lastly*, the avoidance of all hæmorrhage.

The *treatment* is to be conducted in the following manner:—an eyed-probe, armed with dentist's silk, is introduced through the fistula into the *rectum*, from whence the silk is withdrawn through the *anus*, by means of a catch-spring, introduced into the *rectum* upon the finger of the operator. The parts to be divided are then enclosed between the two extremities of the ligature, to which a small fistula-tourniquet is subsequently attached, by passing them through holes provided for the purpose. The requisite amount of tension is maintained by a screw. Care must be taken that the ligature be not so tight, as to cause more than slight uneasiness. After the lapse of two or three days, ulceration of the enclosed part commences and the tourniquet becomes loosened, indicating the necessity of the ligature being made tighter." (p. 221).

(*a*) Lancet, vol. i. 1845, New Series.

Dr. NELKEN (*a*) has proposed for this operation "an instrument composed, *first*, of a rod about eleven and a-half inches in length, the upper third of which is divided into four equal parts, united to each other by hinges so arranged that they can be closed only in one direction, the last being furnished with a knot and a hole to pass the ligature, and *second*, of a tube, through which the former is passed when threaded. The finger being placed in the *rectum*, the apparatus thus prepared, is passed upwards into the fistula until the extremity reaches the finger, the tube is then withdrawn to an extent equal to one of the four divisions of the rod; the whole is next pushed forwards, the finger in the *rectum* causing the rod to bend downwards as it penetrates into the intestine; the same manœuvre is repeated until the ligature appears at the *anus*, when the surgeon seizes it, and terminates the operation." (p. 403).

Although LUKE mentions nine cases in which he had in this way successfully tied anal fistula, I must confess I should not feel disposed to adopt it unless the patient would not submit to the knife, which I am quite sure produces a cure quite as quickly and with less inconvenience; for after the inflammation excited by the fresh cut subsides, there is scarcely any pain during the two or three weeks, usually necessary for healing the wound.—J. F. S.]

936. In complete rectal fistula, of which the internal opening is not very high, a flexible leaden probe should be introduced through the canal of the fistula into the *rectum*, which is then with the fore-finger of the left hand already in the gut to be drawn out at the *anus* and a thread passed into its eye. In the same way, in complete fistula, silk-worm gut may be introduced into the *rectum*, and by it the thread carried in.

937. For tying complete or inwardly blind fistulas which extend very high up, DESAULT, REISINGER, as well as WEIDMANN, SCHREGER, and DEMME have proposed particular apparatus, of which that of REISINGER is preferable. It consists of a blunt silver tube and a probe, provided with a trocar point, which fits the tube, of a watch-spring, which in front has a button and behind an eye, and of a pair of forceps with a moveable gorget.

938. In a complete rectal fistula, REISINGER's apparatus is to be used in the following manner:—The patient being put in the same position as for cutting, the silver tube with its ensheathed probe is to be passed through the fistula into the *rectum* for about three lines' length, which is ascertained by the finger already there. The forceps having been oiled are then introduced into the *rectum* without the gorget, opened, and passed somewhat deeper in, that the tube may project between the arms of the forceps and be held fast by them. An assistant then removes the probe from the tube and passes in the watch-spring, which is provided with the ligature, through the tube into the *rectum*. As the watch-spring projects from the tube, it must be seized with the forceps, which, being closed, are drawn back, so that the watch-spring is drawn out of the *anus*, after it the ligature, and then the tube is to be removed.

In a fistula of the rectal sheath the tube must be brought through the sheath and the fistulous opening into the *rectum*, and then treated in exactly the same way. According to MOTT (*b*) a seton should be first introduced into this kind of fistula, and left there for some days; a thread is then to be drawn through the fistulous opening, and by means of an eyed needle the ends found in the sheath are to be drawn through the *perinæum* and the two ends tied together, as in rectal fistula.

939. In an inwardly blind fistula, the tube with its probe is to be carried by the fistulous canal to its very bottom, the blunt probe removed,

(*a*) Medical Times, vol. xi. 1845. (*b*) Gazette Médicale de Paris, 1841. No. 18.

and the trocar-pointed one introduced, without projecting it from the tube. The forceps, opened, are then passed with the gorget into the *rectum* about an inch above the tube, and both instruments inclined towards each other so that the tube becomes situated between the arms of the forceps. The assistant now thrusts the trocar-point out of the tube, by which the *rectum* is perforated and the trocar-point between the forceps' arms pressed against the gorget, so that the latter may recede from the forceps. The tube being then kept pressed against the gorget, an assistant draws out the trocar, and by means of the fore-finger of the hand holding the forceps, the gorget is withdrawn, and removed from the forceps, which are then closed and the tube held by them. The watch-spring is then introduced through the tube, and proceeded with as already described.

940. The two ends of the thread introduced, are passed into the two openings of a small silver tube, and tied with a simple knot and loop, so tight that the patient may feel a degree of pressure but no pain. For the first day he must keep quiet, but afterwards may go about his usual business. Every three or four days the knot should be tightened as already directed; and care must be taken for the daily passage of soft motions. If much pain arise, the ligature must be tied more loosely, but in other respects the treatment is to be, as after the operation of cutting. The same mode of treatment is to be continued till the partition of the fistula is divided. In order to prevent the destruction of the ligature, at the end of the third or fourth week, if the cure be long protracted, a new ligature must be tied to the old one and drawn through. Usually, after the partition is cut through by the thread, there remains a little cleft, which still suppurates for some time, and heals by the application of some dry lint to the suppurating part.

941. As to the preference of *cutting* or *tying*, the latter mode is usually accompanied with little or no pain; the one indeed is longer, but the patient may go about his business, no bleeding is to be feared, and it may be employed when the fistula is very high. The operation on rectal fistula by ligature has, therefore, considerable preference and is especially indicated in cases, where the fistulous orifice is high up, where the hæmorrhoidal vessels are very large, and in persons who are subject to an habitual *diarrhœa*. Many surgeons, indeed, dispute the necessity of dressing after cutting; but experience contradicts this opinion, and dressing is necessary throughout, if there be bleeding. On the contrary, in rectal fistula the preference is given to the operation by cutting, when the internal opening is not very high, when several neighbouring passages exist, a considerable exposure of the *rectum* is present and the external openings are distant from the *anus*.

Mention must be made of the propositions for compressing rectal fistulas by the introduction of tubes into the rectum (*a*), or by a cylinder of linen stuffed with charpie (*b*).

942. In the externally blind fistulas, if the bottom of the fistula can be ascertained by the appearances already mentioned, (*par.* 927,) it may be cut into externally, and then treated as complete fistula.

(*a*) Bermont, Thèse, Paris, 1827, p. 33.—Colombe Bibliothèque Médicale, 1828, vol. ii.
(*b*) Piedagnel, Velpeau, Dict. de Médecine, vol. iii. p. 328.

[SPASMODIC CONTRACTION OF THE ANUS, AND ANAL FISSURES.

This would seem to be the most convenient place to treat of this subject, which was first clearly described by Boyer (*a*), and afterwards by Dupuytren (*b*), and subsequently by Brodie (*c*).

Boyer does not consider the "rhagades ou fissures" mentioned by Lemonnier as the fissures of which he treats, as they neither originate in the same causes, nor are cured by the same treatment. According to Boyer, "Adults seem to be almost exclusively subject to this disease. I have never seen it," says he, "in children nor in young persons. The greater number of those attacked with it have been between twenty-five and forty years of age; some even above it, and a single person was sixty years old. No class of society is exempt from it; both sexes are alike liable to it; but females perhaps more frequently than men. The characteristic of fissure is a fixed pain at one spot of the circumference of the *anus*. This is always worse whilst passing the stools, but it gradually subsides afterwards. The *m. sphincter ani* is so contracted that the introduction of the finger, of a bougie, or canula is very difficult and extremely painful. The causes of this affection are very obscure. I have only observed that in many persons it has been preceded by hæmorrhoidal swelling, and that in some persons piles had been previously cut off. The disease commences insensibly; the voidance of the stools is attended with heat and smarting; some hours after the evacuation the troublesome pain ceases; the patient is believed to have piles or to have chafed. Sometimes after a few days these symptoms subside. * * * But soon the heat and smarting returns, the evacuations become more painful, and the distress continues longer. The dejections are sometimes mingled with blood, and the pain increases. * * * When the pain is felt the slightest things exasperate it; coughing, urining, leaping, are sometimes sufficient; one patient cannot stand upright and at rest, and another cannot remain sitting. * * * After the disease has continued some time, in addition to these local symptoms there is wasting, and extreme nervous sensibility, sometimes hypochondriasis, sometimes even retention of urine." (pp. 126–30).

"Although there is not the same danger in regard to *Fissures at the Anus*, as in some other diseases in the neighbourhood of this part, yet," says Dupuytren, "they are in general accompanied with such violent pains, that it is of importance to relieve them as soon as possible. The pains have a character in some degree peculiar; they increase gradually, and continue long after passing stool; sometimes lancinating; they are, however, most frequently burning; and patients abound in extreme terms to describe them. Usually they compare them to the sensation of a hot iron penetrating the *rectum*; they so dread passing their motions, on account of the horrible pain which accompanies and follows that function, that they are often observed to strive for a long time against this imperious need, and even to deprive themselves of food to restrain it. These peculiarities are sufficient to discover the nature of the disease. * * * The disease consists in a lengthy and superficial ulceration, about the margin of the *anus*, in the radiating folds of the mucous membrane of this part. On separating the orifice, and directing the patient to strain, a narrow cleft is observed, with its bottom red, and its edges slightly swollen and callous. But to ascertain its extent upwards, it is often necessary to introduce the finger into the *rectum*. It is more commonly seen at the sides or back of the *anus*, than at its fore part. * * * It very rarely extends through the whole thickness of the mucous membrane. The importance of this affection depends principally on the painful spasm of the constrictors of the *anus*. The fissures is but accidental, as is proved by the existence of painful constriction, without any cracking, which, according to celebrated surgeons, is as 1 to 4. This spasm is so great, that the introduction of the mildest bodies is intolerable; the tip of the finger, the pipe of a syringe, excites the most violent pains; and the resistance offered by the *anus* to every attempt at introduction, is a new characteristic sign of the affection. The causes of anal fissures are numerous; constipation and the spasm it produces, specially dis-

(*a*) De la Fissure ou Gercure de l'Anus, accompagnée du reserrement spasmodique du Sphincter; in his Traité des Maladies Chirurgicales, vol. x. Paris, 1825.

(*b*) De la Fissure à l'Anus; in Leçons Orales, vol. iii. 1831.

(*c*) Lectures on Diseases of the Rectum; in Med. Gazette, vol. xvi. 1835. vol. xviii. 1835.

pose to the disease; very hard substances which scrape the mucous membrane, and distend it exceedingly, may give rise to it; the administration of clysters by awkward persons, especially when metallic tubes, pointed or rough are used, are often the immediate cause; they are met with in persons affected with hæmorrhoids, and venereal poison flowing from the generative organs, which happens with many women, is a very common cause of this affection." (pp. 282–85.)

Brodie (*a*) says that "the contraction of the *sphincter* at first appears to be merely spasmodic without any other change of its condition; but in proportion as muscles are called into greater action, so they become increased in bulk; and in conformity with this general rule, when spasmodic contraction of the *sphincter* muscle has existed for a long time, the muscle becomes considerably larger than it was in its natural state before the disease existed. This disease is not of uncommon occurrence; it is met with chiefly in women, especially those disposed to *hysteria*. It is, however, met with in other women, and sometimes in the male sex. The patient under these circumstances is forced to strain very much in passing her evacuations; and this is especially the case when the *fæces* are hard, or even solid. There is pain not only when the *fæces* are being passed, but for a very considerable length of time afterwards; and in some cases the pain will remain from the period of one alvine evacuation to that of another, so that it is constant or nearly so." (p. 26).

The fissures present various differences according to their situation, "those *below* the *m. sphincter ani*, affecting almost entirely the cutaneous tissue, and not the anal mucous surface, produce," says Dupuytren, "a more or less severe *pruritus*, but they interfere little with going to stool, occasion no constriction of the *sphincter*, and consequently are little painful. They most commonly result from venereal affection. The fissures *above* the *sphincter*, attack the mucous membrane, and can only be discovered by the use of the *speculum*. On introducing the finger into the *rectum*, there is felt at the part where they are situated, a cord knotty and hard, pressure upon which excites severe pain. They excite when the patient goes to stool, an indescribable pain, but which ceases immediately after the motion. The *fæces* are covered with puriform mucous, and of a bloody appearance next the fissure. Usually they result from ulceration of internal piles, during the passage of hardened substances. Finally the fissures *at the top* of the *sphincter* are more serious than the former; and it is in them that the so painful constriction of the *sphincter*, and the other symptoms already mentioned, are observed." (p. 284). It is doubtless to this form that Brodie refers, when he says, "in connexion with the spasmodic contraction of the *sphincter* muscle, you will frequently find a small ulcer of the mucous membrane of the *rectum*, which is always in a particular spot at the posterior part, opposite to the point of the *os coccygis*. (p. 26). But he also observes, that, "in some instances the ulcer exists independently of the contracted *sphincter* muscle. * * * It is very difficult to heal, and very frequently it goes on spreading till it becomes of considerable size. It is a superficial ulcer of exquisite sensibility, and great pain is always produced by the passage of the *fæces* over it, lasting for a considerable time after each evacuation. In some instances, considerable hæmorrhage takes place from an ulcer of this kind." (p. 27.)

Treatment:—"The spasmodic construction," says Dupuytren, "is the true ailment; the lengthy ulceration, named fissure or crack, is merely a secondary symptom. If the constriction be removed, the complaint is cured. The application of *belladonna* under these circumstances is naturally indicated, and has been used very frequently with great advantage, when combined with acetate of lead in the following form: of lard 6 gros, of extract of *beliadonna* and acetate of lead, of each one gros. With this a bougie of moderate size is to be greased, and its size gradually increased to that of the little finger. Its continued use for a few days often completely removes the pain." (p. 286). Brodie, however, observes, that though he "formerly used a suppository with extract of *belladonna* with manifest advantage, yet that he is not in the habit of frequently employing it. Even used in the form of a suppository, the *belladonna* sometimes produces very serious symptoms, by its influence on the brain." (p. 26). He, therefore, only gives purgative medicine to prevent hard stools, directs the introduction of a bougie before going to the water-closet, and lets an opium suppository be introduced at night.

"The fissures below and above the *sphincter* most commonly heal," according

(*a*) Lectures on Diseases of the Rectum; in Med. Gazette, vol. xvi.

to Dupuytren, "without any operation; the former, with linen or lint spread with simple cerate, opiate cerate, cucumber pommade, poplar ointment, mercurial preparations, &c., and the latter, by soothing and narcotic lotions of decoction of marshmallow, poppy heads, nightshade, henbane, *stramonium*, and other remedies, thrown up into the *rectum*. * * * But in very painful fissures accompanied with spasmodic contraction of the *anus*, and situated at the very top of the *sphincter* muscle, the most prompt and certain method is that introduced by Professor Boyer, which requires only a common and a button-ended bistoury," (p. 290,) and which is thus described:—"I place the patient," says Boyer, "upon his side, as in the operation for anal fistula; I then introduce the fore-finger of my left hand, smeared with cerate, into the *rectum*, and upon it slip up a bistoury laid flat, of which the very narrow blade is square, and with a rounded tip. The cutting edge is directed right or left, according to the situation of the fissure, and I divide, at a single stroke, the intestinal membrane, the *sphincter*, cellular tissue, and tegument. I thus form a triangular wound, of which the top corresponds to the gut and the bottom to the skin; it is sometimes necessary to lengthen the wound, and I then make a second cut. Sometimes the intestine slips from the cutting instrument, and the wound of the cellular tissue extends higher than that in the gut; the bistoury must then be again introduced into the *rectum*, for the purpose of lengthening the incision of the gut. If the constriction be very great, I make two cuts, one on the right and the other on the left, and when the fissure is before or behind, I do not include it in the wound. A large bougie is then to be introduced into the wound or into the two wounds, to prevent their edges uniting irregularly. A slight plugging with lint is then made, some pads applied, and the whole supported by a bandage." (p. 137). A very important caution, in reference to operating on women, is given by Brodie. "In a female subject, whether you divide the *sphincter* in a case of fistula, or in one of any other disease, I caution you, that you should never make your incision exactly in front, towards the *vagina*. The wound made in this direction does not heal in a proper manner; the muscle, if divided at this point, is never a perfect *sphincter* afterwards, and the patient labours under an incontinence of *fæces*, from which she never completely recovers, and which makes her miserable for life. Then, it is not advisable, in either sex, that you should divide the *sphincter* directly backwards towards the *os coccygis*. If you do, you will find that the wound does not very readily close, and that it is liable to crack and be re-opened afterwards. There is a sufficient anatomical explanation of what I have now mentioned. You will recollect that the *sphincter ani* consists of two parts or layers. The inner layer is circular, embracing the *anus* like a ring; the external layer on each side is attached posteriorly to the apex of the *os coccygis*, by elastic ligament, and anteriorly to the central portion of the *perinæum*. If you cut in the direction backwards towards the *os coccygis*, you divide, it is true, the inner or circular layer of fibres, but not of the outer layer. The knife passes between the two lateral portions of this outward layer and simply splits or separates them; and the contractive power of this part of the muscle remains and interferes with the cicatrization of the wound." (p. 186). "The operation of dividing the *sphincter*," he elsewhere observes (*a*), "is not very painful, except in those cases where the disease is complicated with ulcer at the back of the *rectum*; neither is there ever any hæmorrhage of consequence, as the pressure of the finger or a plug of lint will command it. The relief is immediate, and the very next time that the patient has an evacuation there is an end of all the pain and difficulty which she suffered before. It is better, however, that she should not have an evacuation immediately after the operation, and, therefore, I generally give her an active purgative on the preceding day, and some opium afterwards, to keep the bowels constipated. After two or three days, castor oil may be exhibited and the bowels opened. The wound requires very simple treatment; a little dressing of lint may be applied to it till it is cicatrized, and cicatrization is generally completed in about three weeks. No inconvenience whatever follows the division of the *sphincter* muscle, except it be made as I have mentioned, in the female, in the direction forwards. The patient retains her *fæces* as well as ever, and yet the difficulty of voiding them is relieved." (p. 27.)]

(*a*) Med. Gazette, vol. xvi.

E.—OF URINARY FISTULA.

(*Fistula Urinaria*, Lat.; *Urinfistel*, Germ.; *Fistule Urinaire*, Fr.)

Desault, Œuvres Chirurgicales, vol. iii. p. 287.

Howship, A Practical Treatise on the symptoms, causes, &c. of the most important Complaints that affect the secretion and excretion of the Urine. London, 1823. 8vo.

Chopart, Traité des Maladies des Voies Urinaires. Nouv. Edit. par Felix Pascal, Paris, 1824, vol. ii. p. 269.

Bell, Charles, above cited.

Brodie, Sir Benjamin, Clinical Lecture on Perinæal Fistula; in Medical Gazette, vol. xvii. 1836.

943. Under the term *Urinary Fistulas*, strictly, are understood, long and narrow ulcers opening in any part of the urinary passages; fistulous sores, however, in their neighbourhood are included under the same head. Urinary, like rectal, fistulas are therefore distinguished into *complete* and *incomplete*, according as they have an internal aperture communicating with the urinary passage, and an external opening, or the latter only. The incomplete urinary fistulas are either *incomplete internal*, or *incomplete external*.

944. The external opening of urinary fistula may be situated either in the *perinæum*, *scrotum*, *penis*, buttocks, thighs, loins, belly, in the *vagina* or in the *rectum;* as the internal opening may be connected with the kidney, ureter, bladder, or *urethra*. The direction of fistulous passage is mostly curved, several passages often run into one and the same opening; but rarely do several external apertures lead to as many internal. Usually the walls of the fistulous passages are very hard and the callosities wide-spread.

945. The *incomplete external* or *false urinary fistula* (*Fistula urinaria incompleta externa, seu spuria*) occurs mostly in the neighbourhood of the *urethra*, after abscess or ulcer, in which pus has collected and burrowing in different directions, has destroyed the cellular tissue surrounding the *urethra* or bladder, and produced a sinuous ulcer which resists the healing powers of nature. They may be connected with hardening, with *caries* of the pelvic bones, and the like. Besides the preceding appearances, they are characterized by no urine escaping from them nor any pus from the *urethra*, and by the probe used in examining them penetrating neither into the *urethra* nor bladder, nor touching a catheter introduced into the latter.

946. The *incomplete internal urinary fistula* (*Fistula urinaria incompleta interna*) usually occurs in the *urethra*, rarely in the ureters or bladder, and depends on tearing by external violence, retention of urine, neighbouring abscesses, ulcers, rough catheterism, or an imprisoned stone. The *diagnosis* depends on the previous symptoms, on the sensation of pain during or after passing water, on the bloody purulent discharge from the *urethra*, but especially on a swelling, which increases during micturition, diminishes or disappears entirely by pressure, in consequence of which urine mixed with pus, flows from the *urethra*, or on the appearance of an undefined extravasation of urine into the cellular tissue.

In persons who have lost flesh by sweating or in any other way, there often occurs, without any previous contagion, a flow of *mucus* from the *urethra*, and a swelling at some part of its neighbourhood, which runs into suppuration, bursts, and gives escape to the urine, in which the flow of *mucus* from the bladder continues, but without any stricture existing. The destruction of the *urethra* depends on ulceration of the mucous membrane or abscesses in the *lacunæ* (*a*).

[This incomplete fistula I have seen though not very frequently, and have more commonly observed it in front of the *perinæum*, and involved in the *scrotum*, sometimes at its hind and at other times in its front part. It has been exceedingly well described by Brodie in the following terms:—"I shall next describe a case which used to perplex me very much when I first met with it. A patient may come to you who has, perhaps, had *gonorrhœa* formerly, which has been followed by a stricture, perhaps a very slight one, of the *urethra*, or at any rate there has been a discharge from the *urethra*, which he calls an obstinate gleet, telling you at the same time that nothing will cure it. You examine the *perinæum*, and you find in it a little tumour, not bigger apparently than a horse-bean or filbert. You can just feel it, at some distance below the skin, and the patient tells you that he has had it ever since he has been the subject of this obstinate gleet, and that sometimes there is a little pain in it. Now such a little hard tumour is nothing more nor less than a blind fistula. There is a small orifice in the *urethra*, and a narrow channel communicating with it, which leads into a cavity in the centre of this hard lump, and every time the patient makes water a very small portion of urine finds its way into this cavity. In consequence of the smallness of the central cavity and the great deposit of solid matter on its outside, the fluctuation of fluid in it is not perceptible. Such a case as this is not a very uncommon occurrence, and I have known a patient labour under this sort of hard lump in the *perinæum* for many successive years, suffering a good deal of inconvenience from it, but not suffering excessively. I have cured several cases of this kind by a very simple process. All that you have to do is to make an opening into the cavity in the centre of the tumour. But the cavity is very small and how are you to find it? You may run a lancet into it; but it is very probable that it may pass on one side of the cavity, and therefore some management is necessary in performing the operation. You are to introduce the lancet a little obliquely, so that you may, as it were, almost cut the tumour in half. When you have done this the blood and the deep-seated situation of the tumour prevent you seeing whether you have made the opening into the central cavity or not. Introduce a piece of lint, so as to prevent the wound uniting by the first intention. Two or three days afterwards you take out the lint, and then you ascertain whether, when the patient makes water, any comes by the opening made with the lancet. If this be the case you may be certain that you have penetrated into the cavity, and then you have only to dilate the *urethra* with a proper instrument and the patient will get well. But if you find that the urine does not flow through the artificial opening, you may thus proceed:—Introduce a piece of caustic potash through the opening you have made down to the bottom of it, in the centre of the tumour, so as to make a slough there. A portion of the tumour will slough out, and it is most probable that the cavity in the centre will be exposed, and then a cure follows. You should apply the caustic potash in such a manner that it may act on the part on which you wish to act, defending at the same time the neighbouring textures, the skin especially, by washing it with vinegar." (p. 489.)]

947. *Complete urinary Fistula* (*Fistula urinaria completa*) is the most common. Its internal opening arises either from the kidneys, ureters, bladder or *urethra*, and its external aperture, often very far distant from the internal, is found in the loins, in the groin, above the share-bone, in the *perinæum*, and so on; or it communicates with the *rectum*, with the *colon*, with the *vagina* in women, or with the cavity of the belly, in which case there is always a fatal effusion of urine into it. Complete urinary fistulas are mostly consequent on retention of urine, tearing, injury of the bladder, or an incomplete internal or external fistula. These, which in men open into the *rectum*, frequently occur after the

(*a*) Cooper, Astley.

operation for the stone, as those connected with the *vagina* take place after difficult delivery, or after ulceration of the *vagina*. Cancer of the *rectum* and of the *vagina* may also produce urinary fistula.

Complete urinary fistula is characterized by the escape of urine, which is constant, if the fistula be from the bladder, but only whilst making water, if from the *urethra;* this escape, however, is not always present in complete fistula, as if the fistulous passage be very narrow, and the *urethra* not obstructed, the urine often passes by the latter alone, and in fistula of the bladder, if the canal be very narrow and curved, often only by straining whilst emptying the bladder. It also depends on the condition of the fistulous canal, whether the probe introduced into it can be made to touch a catheter in the *urethra* or bladder. If the fistula communicate with the *vagina* or *rectum*, the urine escapes by these canals; or the opening of the fistula is felt by the finger introduced into it, or merely by the sound passed into the bladder. If the fistula be connected with the *rectum* the urine flows through it or is mixed with stool. Less constant are these symptoms, viz., hardening of the course of the fistulous canal, or in the whole extent of the *perinæum*, inflammation, unhealthy suppuration, proud flesh about the fistulous opening, loss of power, wasting, hectic fever, and the like.

948. The *prognosis* in urinary fistula depends on its situation and extent, on the constitution of the patient, and on other diseases connected with it. Complete fistulas, of which the internal opening is connected with little loss of substance, heal more easily than those which have it with greater loss of substance; fistulas of the *urethra*, under similar circumstances, heal more readily than those of the bladder. When the canal of the *urethra* is considerably changed, greatly narrowed, or entirely obstructed, and cannot be re-opened, the cure is impossible. Urinary fistulas communicating with the *vagina* or *rectum* are extremely difficult, and frequently not to be healed. A bad state of the patient's powers renders the *prognosis* very doubtful.

949. The *cure* of incomplete external fistula requires the general treatment of fistulous sores. Suitable pressure often assists the healing; often must the fistulous orifice be enlarged by a conical cut, of which the point is directed towards the *urethra* or the bladder, the source of the pus laid bare, every neighbouring passage opened, and care taken for the free flow of the pus. If there be callosities, dispersing bran poultices and proper digestive remedies must be employed. If *caries* be connected with this fistula or any general affection be connected with it, the treatment must be modified according to general rules.

950. Incomplete internal urinary fistula requires the introduction of a catheter, which often, if the *urethra* be narrow, must be preceded by the use of the bougie. The catheter must be of moderate size; otherwise it fills up the *urethra* too much, or the urine escapes by its side. If the fistula be old and the cure do not in this way take place, the incomplete must be changed into a complete fistula by a suitable cut, which is also necessary in extensive urinary infiltration, where several incisions often must be made, in order to prevent the gangrenous destruction caused by the escape of the urine.

Stones frequently lie in the sac of a blind fistula, in which case cutting into it and

the removal of the stone is necessary, and afterwards the treatment is to be as in complete fistula. Compare also what is hereafter said about urinary stones exterior to the urinary passages.

951. Complete urinary fistulas communicating with the kidneys, or ureters, require no assistance, unless kept up by the pressure of a foreign body or by prevention of the flow of urine from the bladder, in which case perhaps the restoration of the natural area of the *urethra*, or the removal of the foreign body, may contribute to the cure.

952. Complete urinary fistula is situated either between the *scrotum* and the *glans penis*, or between it and the *anus* in the *perinæum*. The difference of the seat of the fistula depends on its course, and requires different treatment.

953. In the first case, (*Fistula urinaria penis*), the fistulous opening is most commonly on the under side of the *penis*, varying in size, so that either all the urine and *semen*, or only part of it, escapes thereby. It presents different conditions, according to its cause and duration; it is often connected with surrounding hardness and copious suppuration, especially if it arise from stricture; often it forms an extremely minute and obliquely running aperture; often the skin and the neighbouring mucous membrane of the *urethra*, skin over, and do not suppurate; often is a large portion of the lower wall of the *urethra* destroyed, and the opening varying in size, surrounded with a hard scar, as in destroying ulcers or wounds with loss of substance. In narrow and obliquely running fistulas, the introduction of a probe, through the fistula, and of a catheter through the *urethra*, shows the seat of the internal opening.

954. If the fistula be accompanied with narrowing of the *urethra*, this must be first got rid of by bougies, and then by the continual wearing an elastic catheter, which should be properly fastened, the urine must be conveyed from the fistula. At the same time, any disease, standing in causal relation to the fistula must be attended to, and care taken for the cleanliness and diminution of the irritated condition of the parts surrounding the fistula, by warm hip-baths, leeches, poultices and so on; and the patient's constitutional powers must be improved by attention to diet and tonic remedies. The cure usually takes place without further assistance, if the fistulous orifice be not too large, and its walls not too much changed.

955. If, when the *urethra* have attained its proper size, the cure of the fistula do not take place, or if there be scarcely any diminution in the size of the stream of urine, the cause of the obstinacy of the fistula is its callous or some other condition. Then, if the fistula form a canal, it must be divided and filled with lint to promote the development of granulations; or the edges of the fistula, especially if they be callous, must be touched with caustics, as lunar caustic, nitric acid, (A. Cooper,) a solution of caustic potash, or with *tinct. canth.*, (Dieffenbach), because this is less destructive than irritative. In the application of the caustics, a moderately thick bougie should be introduced into the *urethra*, the cauterization repeated after the separation of the slough till good granulations are produced, the scarring of which may be assisted with lunar caustic. After the narrow or oblique fistula has been dilated, Dieffenbach recommends the cauterization of the whole fistulous canal, by means of

a pencil, three times within six or eight hours, a wax bougie being in the *urethra*, after which an elastic catheter is to be introduced and fastened; next morning the slough is to be removed by introducing a fine piece of sponge into the fistula, and the cauterization repeated after suppuration has been set up, till good granulations are developed. The catheter should always be changed twice a-day. In two or three months the cure of a tolerably large fistula may be effected, rarely however is the healing thus produced, and although the external opening be closed, it may be again burst open by a large stream of urine or during connexion (Dieffenbach).

If the cauterization of such fistulas do well, it may not merely be confined to the callous edges, but may be extended to the immediate neighbourhood, as Roser especially has done, and my own practice has assured me.

956. For closing these urethral fistulas, the suture of various kind, has been used, the interrupted stitch, (A. Cooper, Dieffenbach and others), the glover's stitch, (Zang), the twisted stitch with five insect-pins, (Dieffenbach and others), the quill stitch, (Friemann), and the splint stitch, (Dieffenbach), which resembles it. The result has been, however, rarely satisfactory, because the thin edges of the skin afford insufficient points of union, and are little disposed to adhesion, which is also easily destroyed by the trickling urine, in spite of the catheter which has been introduced. The patient should be placed, as in the operation of cutting for the stone, and after a catheter has been introduced, the edges of the wound should be made raw, in small fistulas with caustic, or by shaving off the skin with a thin knife, and in larger openings a thin slice must be removed. According to the different size of the fistulas are a sufficient number of threads to be introduced with a fine needle, or sufficient insect-pins to be passed into the bottom of the fistula, and the union effected by tying together the threads, or twisting the silk around the pins. If much tension of the skin arise in consequence, a longitudinal cut must be made into the skin, half an inch from the wound and stretching beyond it, in order to relieve the tension, and to prevent the pins tearing out.

957. In fistulas not of large size, if surrounded with healthy skin and not immediately behind the *glans*, Dieffenbach has proposed and proved the running stitch as the most efficient. A catheter is to be introduced and the fistula frequently pencilled with *tinct. canthar.* On alternate days the blisters which have been produced are to be removed, and a short tolerably thick elastic bougie introduced into the *urethra*. A thick, double-waxed silken thread is now to be passed, with a curved needle, a quarter of an inch from the edge of the fistula, so that the threads may lie deep, without injuring the *urethra*. As the needle cannot be at once thrust through the whole extent, it must be thrice passed through, and introduced again through the same punctures, till in the end it comes out through the first puncture and the threads are drawn after it. Both ends of the thread are now to be tied with the double knot, so that the threads lie deep in the cellular tissue. The bougie is then removed, and no catheter introduced. A slight swelling of the *penis* occurs; towards the seventh day, the threads become loose and can be somewhat drawn out; they may then be cut through and the part covered with

sticking plaster. If a slight fistulous orifice remain, it may be touched with *tinct. lyttæ*, or the operation repeated.

958. In those fistulas which have much loss of substance, various experiments have been made to close them by grafting skin (*Urethroplasty*). A. Cooper, Earle, Alliot, Delpech, Ricord have formed the covering flaps from the skin of the *scrotum* and groin twisted round; but Cooper and Alliot alone have obtained any satisfactory result. The ground of this frequent disappointment is easily perceived, and Dieffenbach has proposed for such cases a corresponding operation by transplanting by means of removing the skin.

959. In fistula near the *scrotum*, after the catheter has been introduced into the bladder, the edges of the fistula are to be seized with a pair of hook forceps, and so drawn out that a transverse wound with two sharp points stretching on each side of the *penis* is formed. A longitudinal fold of the skin of the *scrotum* is to be then raised and cut through to the extent of two inches, so that a transverse wound, parallel to the former, is produced, and the bridge of skin which has been formed by it is detached from its base by cutting horizontally, then drawn forwards and fastened with five or six twisted stitches to the edge of the skin of the *penis*. Beneath the hinder edge of this bridge of skin, an elastic bougie two inches long is to be introduced to the aperture in the *urethra*, in order to divert the urine pressing out by the side of the catheter. After some days the threads are to be removed, and the union to be sustained with sticking plaster.

960. In large fistulas in the middle or fore part of the *penis*, the transplanting of the skin may be effected in various ways. In great deficiency of the *urethra* in the middle of the *penis*, with destruction of the skin, so that the edges of the latter cannot be drawn over the opening by lateral incision and setting free the bridge, the edges of the skin about the aperture must be set free, without separation, so far as may be easily done, then a longitudinal incision must be made on each side of the root of the *penis*, so that the wound occupies two-thirds of the extent of the *penis*. The outer skin of the prepuce is then to be drawn somewhat back, the skin of the first incision raised on the opposite side of the *penis*, behind the *corona glandis*, in a large longitudinal fold, and here also two-thirds of the skin of the *penis* cut through. The covering of the *penis* included between the two incisions and usually forming a bridge of skin two inches broad, is now to be separated, the edge raised with a pair of forceps, and the cellular tissue divided with a pair of sharp eye-scissors. The skin is now to be drawn completely down, so that the sound skin of the back of the *penis* descends and completely covers the hole in the *urethra*. Any tension of the skin is relieved by lengthening the incision. To prevent the collection of blood between the skin and the *penis*, the bleeding must be carefully stanched, and then the retraction of the skin to its old situation prevented, and its union promoted by some stitches and by some narrow strips of well sticking adhesive plaster. From the hinder edge of the wound, on the under side of the *penis*, a piece of elastic bougie is pushed beneath the skin, towards the hole in the *urethra*, in order to conduct externally the urine dribbling by the catheter. Erections must be especially prevented, and on their occurrence the

strips of plaster must be cut through. After four or five days, if the skin be grown together, the threads may be cut, but the application of the sticking plaster must be continued. The bougie is only to be left off after the most complete healing.

961. According to DIEFFENBACH, if there be a hole close behind the prepuce, the external layer of the prepuce should be transplanted backwards as an entire ring, the outer layer of the prepuce being raised up before the fistula and cut through, so that the wound may occupy more than two-thirds of the circumference of the *penis*. Behind the fistula a corresponding incision is formed by the oblique division of a longitudinal fold, so that the two cuts join at their extremities, and thus an oval island is formed, having in the middle the fistula which has been prepared by some strokes of the knife laid flat. The edge of the wound in the prepuce is now raised with a pair of hook forceps, the cellular tissue connecting the outer and inner folds of the prepuce, divided with eye-scissors, the *frænulum* cut through, as well as the outer fold of the prepuce, where connected with the *glans*, and thus an opening is formed of half an inch for the introduction of a small bougie, for the escape of the secretion of the wound and the prevention of urinary effusion. The hinder edge of the outer layer of the prepuce is to be drawn back and united to the corresponding wounded edge of the skin of the *penis* by seven or eight stitches and the connexion supported by narrow strips of plaster crossing in the back of the *penis*. In very narrow prepuce both its layers must be divided to the *corona*.

962. In large openings immediately behind the *glans*, if the prepuce be deficient, DIEFFENBACH recommends the removal of the callous edges, so as to form a transverse cleft, and then by depressing the *glans* the edges of the wound are brought together and united by two interrupted stitches, the one end of which is to be cut off and the other carried by a blunt needle through the fistula to the mouth of the *urethra*. The neighbourhood of the fistula and the whole under surface of the *glans* is then to be set free, to the extent of a line with a pair of hook forceps and a small scalpel. The extent of the cut must be bounded by penetrating perpendicular incisions, and the wound have the shape of a half oval, of which the rounded part is to be directed towards the orifice of the *urethra*, its straight part backwards and its two angles reaching up to the back of the *penis*. The skin is now raised in a longitudinal fold, at the hinder and under part of the *penis*, and cut through obliquely, so that the ends of the cut are directed upwards and forwards. This bridge of skin, so entirely separated that it remains connected only on the back of the *penis*, is drawn forwards over the surface of the wound and over the fistula, and connected with the edges of the wound of the *glans* by fine interrupted stitches. The hinder surface of the wound is covered with soft lint and sticking plaster, and beneath the hind edge of the ring of skin, a piece of bougie is introduced in order to carry off the urine somewhat escaping by the side of the catheter. Inflammation is to be prevented by cold applications and subsequently lukewarm lead wash, and the threads projecting from the *urethra*, as well as the catheter, are to be drawn out when they have cut through the edges. In one case DIEFFENBACH had a favourable result; in another the cure was frustrated by erection and discharge of the *semen*.

Upon Urethroplasty compare—

Cooper, A., above cited.

Delpech, Chirurgie Clinique de Montpellier, vol. ii. p. 581.

Blandin, Autoplastic, p. 180.

Dieffenbach, Ueber die Heilung widernatürlichen Oeffnungen in den oorderen Theile der männlichen Harnrohre; in Hamburger Zeitschrift, vol. ii. pt. i.

Zeis, Handbuch der plastischen Chirurgie, p. 506.

In one case in which, by a deeply-eating ulcer, the *urethra* was completely destroyed to a considerable extent, Charles Bell undertook the formation of a new passage for the urine. A hollow sound was introduced through the fistulous opening, and through the orifice of the *urethra* a silver tube six inches in length, into which a metal sound and a pointed stilette could be passed, was passed by the *urethra* to the beginning of the fistula. He then thrust the stilette through the body of the *penis*, near the original canal of the *urethra*, and endeavoured to bring its point on one side of the fistula into the groove of the hollow sound, following the proper canal of the *urethra*. This canal was then rendered callous by continuing the tube in it. During the course of this operation no blood was lost, the symptoms were not severe, but there remained a small lateral opening at the previous seat of the fistula (*a*).

963. Complete urinary fistula in the hinder part of the *urethra*, of which the inner opening corresponds to the *bulb*, the *membranous* or *prostatic* part of the *urethra*, (*Fistula urethro-perinæalis*,) arises either from a previous incomplete fistula, (*par.* 946,) or after infiltration of urine, most commonly depending on stricture, bruising, tearing, or wound of the *urethra*, or stone, severe inflammation and ulceration. The external opening is either in the *perinæum*, in the neighbourhood of the *rectum*, on the *penis*, or in the groin; often there are several openings existing at once on these several places, which, however, are connected only with *one* internal opening. These fistulas are generally accompanied with considerable hardening of their neighbourhood, with hardness of the whole *perinæum*, and even of the *scrotum*. The urine, whilst being passed, escapes through them only in part, or it flows entirely through the fistula; in which case, if long continued, the fore part of the *urethra* contracts and shrivels up. If in old strictures there be a paralytic condition of the neck of the bladder, the urine will constantly and unwittingly flow by the fistula. In consequence of the continued irritability of the fistula, and its neighbourhood, of the suppuration and so on, the general health gradually suffers much, the patient wastes, the digestion becomes bad, and on the least occasion, severe though generally slight consecutive fever ensues.

[Brodie, observes, that "*a fistula in perinæo* occurs in some cases, as a consequence of *gonorrhœa;* in other cases as the consequence of stricture, either independently of *gonorrhœa*, or long after it has subsided. These two kinds of *fistulæ in perinæo* require each a separate notice. A man has a severe *gonorrhœa;* the urine comes away in a very small stream, because the *urethra* is inflamed, swollen, and contracted. At last he complains of pain in the *perinæum;* a tumour is found there, and this state of things is frequently attended with a complete retention of urine in the bladder; at other times, however, it is attended only with an increased difficulty of making water. By-and-by the tumour bursts, or perhaps the surgeon feels fluctuation in it, and opens it with a lancet, pus is discharged, then the difficulty of making water subsides, and a day or two afterwards the patient finds that whenever he voids his urine, a portion of it comes by the opening in the *perinæum*. In another case, the patient has, perhaps, never had *gonorrhœa;* or if he has had one, it has subsided and left a contraction or stricture of the *urethra*. On some occasion he has more than usual difficulty in making water, but not amounting to a complete

(*a*) System der operativen Chirurgie, vol. i. p. 102.

retention of urine. Under these circumstances, he discovers a swelling in the *perinæum*, which increases in size, and becomes painful and tender. The tumour bursts, or the surgeon opens it; matter escapes also in this case, and afterwards a portion of the urine comes away through the opening. Where this disease is connected with *gonorrhœa*, there is generally only a single abscess; but when it is connected with a stricture of the *urethra*, there may be many abscesses formed in succession; so that a patient having a stricture of the *urethra* of long standing, may have *fistulæ* formed in various directions, opening into the *perinæum*, in the middle of the *scrotum*, nay, even in the groin, or on the *nates*, or one of them may, perhaps, open into the *rectum*." (p. 486.)

As regards the immediate cause of these kinds of perinæal abscess, as "in many cases the contents of the abscess bear manifest indications of urine having been mixed with them, and that in all cases, in the course of two or three days after the abscess has burst, urine begins to flow through it; I think you will be inclined to believe with me, that an aperture must have formed by ulceration in the mucous membrane of the *urethra* in the first instance. Such ulceration would allow a little urine to dribble in to the cellular membrane, and the formation of an abscess would be the necessary consequence. This is the simplest way of explaining the formation of these *fistulæ*, and it explains every thing about them. The escape of even a single drop of urine into the cellular membrane would be sufficient to do all this mischief." (p. 487.)]

964. As these urethral fistulas are for the most part connected with narrowing of the *urethra*, the first indication consists in the proper widening of this canal, with wax or elastic bougies, to its proper size. For the due carrying off the urine from the fistula, the introduction of the elastic catheter occasionally, through which the urine may pass, is necessary. If in this treatment, any disease having causal relations to the fistula be attended to, if care be taken for cleanliness and the diminution of the irritation of the parts surrounding the fistula, by poultices, warm hip-baths, leeches, and the like, the patient's condition is improved; if any foreign body in the fistula be removed, it generally heals without further assistance.

Opinions vary as regards the introduction of a catheter, in the cure of the urethral fistulas. The objections made by HUNTER, B. BELL (*a*), RICHTER (*b*), and others (*c*), to the introduction of the catheter in the cure of urethral fistulas, are, that the catheter, if suitable for its purpose, must completely fill the *urethra*, by which the edges of the fistulas are separated, and the cure prevented; if the catheter be too small, the urine escapes by its side and comes in contact with the fistula. The continuance of the catheter in the *urethra* is extremely painful to many patients, and does harm by keeping up the irritation; experience also shows that fistula of the *urethra*, when the latter has attained its natural size, heals without the in-lying of the catheter. As, however, experience declares as well for the contrary, so if the internal fistulous opening be a small one, the introduction of the catheter be very painful for the patient, and therefore it is impossible that the whole canal of the *urethra* can be filled by it and the urine completely withdrawn from the fistula, the introduction of the catheter must be given up. On the other hand, under opposite circumstances, and if it be observed that the cure of the internal fistulous orifice give rise to a narrowing of the *urethra*, the introduction of an elastic catheter may and should be attempted. Only in fistula arising from ulceration of the *urethra* without stricture, (*par.* 946), is the use of the bougie and catheter doubtful, as they only increase the disposition to ulceration, and the local as well as the general irritation. Corresponding remedies must be employed internally to the constitutional powers.

[As the cause of the continuance of perinæal fistula is the dribbling of the urine through it in consequence of the contraction of the *urethra*, in front of the aperture by which it escapes by that canal, "to cure the fistula you must," as BRODIE ob-

(*a*) BELL, BENJAMIN, System of Surgery, vol. ii. p. 240.

(*b*) RICHTER, Anfangsgründe, vol. vi. p. 338.—ZANG, darstellung blutiger, heilkunstlerischer Operationen, vol. iii. pt. ii. p. 327. —COOPER, A., above cited.

(*c*) DESAULT, Œuvres Chirurgicales, vol. iii. p. 291.

serves, "remove the contraction, restoring the *urethra* to its natural diameter. In a case of fistula after *gonorrhœa*, this is easily accomplished. A few introductions of a bougie will probably be sufficient to dilate the *urethra*, and make the fistula heal. In cases of *fistula in perinæo*, connected with chronic stricture of the *urethra*, the treatment is just the same. All you have to do, is to cure the stricture, and in nineteen cases out of twenty, by the time that is fully dilated, the fistula is healed. It is more easy for the urine to pass along the natural passage, if it be of its proper diameter, than it is for it to pass through the oblique passage of the fistula. The fistula has generally a kind of valvular opening in the *urethra*, into which the urine does not easily flow; and when you have dilated the stricture in front of the fistula, the urine having a free passage in that direction, ceases to flow in the other." (p. 487)].

965. When, although the *urethra* has acquired its usual size, the healing of the fistula does not take place, and this depends on the callous or other condition of the fistula, together with the pus and urine escaping by the sides of the catheter, and collecting in it, the fistula must be opened with a bistoury upon a director introduced into it and connected with the groove of a staff passed into the bladder, so that the wound has a funnel-like shape, and its point corresponding with the internal opening of the fistula. If there be several fistulous passages, each must be divided with the director and bistoury. If the internal fistulous opening be very callous, it may be scarified, or touched with *tinct. lyttæ*. The wound may be either gently filled with lint, fastened with sticking-plaster, and a T-bandage, or merely covered with a sponge soaked in warm water. The wound fills from the bottom by granulations, the scarring of which may be promoted by touching with lunar caustic.

[The continued in-lying of a gum elastic or silver catheter in the *urethra*, after the complete dilatation of the stricture has been effected, does not always lead to the healing *perinæal* fistula, for however completely emptied the bladder may be kept, a little urine will always flow by the side of the catheter, and dribbling through the fistulous passage, keep it open. But another circumstance also takes place, more especially I think I have remarked it, when a silver catheter has been kept in, and which, as Brodie has well observed, depends on "the catheter acting like a seton, inducing inflammation and suppuration of the mucous membrane of the bladder; and some of the *pus* which is secreted passes through the fistula and keeps it open just as much as it would keep open by the urine itself. In some cases," he continues, "I have adopted the following method: I have made the patient draw off the water with a catheter three times a-day, so that he should never make water except through the catheter, and thus that the urine should be altogether prevented from finding its way into the fistula. This is a better mode of treatment than the constant retention of a gum catheter in the bladder; and yet it will sometimes fail." (p. 488).

In cases where a perinæal fistula is slow in healing, Brodie says, he has with some success, "endeavoured to stimulate the bottom of the fistula, so as to make that heal, whilst he took measures to prevent the orifice from healing prematurely. This was effected in the following manner: he melted a little nitrate of silver in a spoon of platina, and dipped the end of a probe in it; which being repeated two or three times, the end of the probe became covered with a varnish of caustic. Thus prepared, he introduced the probe quite to the other end of the fistula; and when he had done this, just touched the orifice of the fistula very slightly with the caustic potash. The effect of nitrate of silver upon a sore surface is not so much to make a slough as to stimulate it to contract, granulate, and heal, whereas the effect of caustic potash, is to make a slough and prevent healing." (p. 488).

Upon the question, if a fistula exist in the *perinæum*, attended with some little contraction of the *urethra*, not giving the patient much inconvenience, so that it may not much attract his attention, "Are you to allow him to remain thus because the fistula is not very troublesome?" Brodie gives for answer, "Certainly not; for

you do not know to what mischief it may ultimately lead. The matter on some occasions may not readily escape; it may burrow and cause sinuses in other directions, and may even do still greater mischief. Mr. VINCENT and myself attended a gentleman who had suffered under a *fistula in perinæo*, and which he had neglected for a great many years. At last he observed the callosity around it grew bigger and bigger, so that it ultimately extended to the *scrotum* and *penis*. When we were called to see him we found him with a malignant disease, either *carcinoma* or *fungus hæmatodes*, which had clearly had its origin in the fistula, and had extended from that to the neighbouring organs. The patient ultimately died in great distress and misery." (p. 489)].

966. If the narrowing of the *urethra* be such, that it cannot be got rid of in a space of time in which, by the reaction of the fistula upon the whole constitution, life is to be feared for, there remains nothing else than to introduce a staff into the *urethra*, down to the seat of stricture, which is to be held by an assistant. A director is then passed through the fistula into the internal opening, and the fistulous passage divided on it to the stricture, and this towards the staff. But if the fistula do not lead to the stricture, all the soft parts in the direction of the point of the staff must be cut into, and the staff thrust forwards into the bladder, into which an elastic catheter may then be passed. If the *urethra* at the seat of stricture be completely closed and degenerated, a staff must be, as in the former case, introduced down to the stricture, and laid bare by a proper cut through all the covering parts, the hardened part of the *urethra* must be taken hold of with the forceps, and cut out with the knife or scissors, after which an elastic catheter is to be introduced through the *urethra* into the bladder, and properly fastened. The wound is either to be lightly filled with lint, or covered with a wet sponge. This operation is always difficult and dangerous; considerable bleeding, violent inflammation, and wasting suppuration and the like, may be its consequences. But it is certainly very rarely necessary, as with proper attention and perseverance, the most considerable stricture may be overcome, and by proper division of the fistulous passages, the obstacles preventing the cure may be removed.

[The operation of dividing the stricture, when it has become so tight that the urine will not pass by it, but only by the fistulous opening, is not, or ought not, to be attended with either difficulty or danger, but should never be undertaken without the surgeon is well acquainted with the anatomy of the parts. It differs in no respect from the operation in the *perinæum* performed constantly, for cases of retention of urine from stricture, and which if there be either no extravasation of urine or but little, rarely do otherwise than well, and both retention and stricture are at once relieved. When there is perinæal fistula, there is more difficulty in the operation than in simple stricture, because the neighbouring parts are always thickened, and their natural character greatly altered; and also after the stricture has been divided, and a large catheter introduced into the bladder, the sides of the fistula having acquired a mucous membranous-like character, are little disposed to heal unless their surface be destroyed and new granulations encouraged.

The operation is best performed by introducing the catheter down to the stricture, and then finding its point by cutting straight through the *raphe*, till the catheter point is exposed, which is to be the guide for the subsequent part of the operation. It is very advisable that the external wound should be free; a large clean cut wound heals almost as readily as a small one, and it is preferable, not only as giving the operator more room to act upon the part specially to be acted on, but also is less likely to slough, because the tearing and pulling commonly necessary with a small wound to make room, which cannot even then be obtained, almost invariably produces sloughing. When the point of the catheter has been found, the dissection is to be prosecuted backwards in the track of the *urethra*, and from time to time the

wound must be examined with a director or a female catheter, of which the point should be directed backwards and upwards, the patient being at the same time desired to force, so that the flow of urine may direct to the aperture in the *urethra*. It is also very good practice to introduce the finger into the *rectum*, so as to prevent the director or catheter being thrust into the *rectum* or between the bladder and *pubes*, which I have known done, and produce very serious consequences. With patience and tenderness the under end of the *urethra* may be generally found, and the catheter from the upper part of the *urethra* must be pushed through it into the bladder, and there left. I do not approve of cutting away the hardened part of the *urethra*, as recommended by CHELIUS, as it is quite needless, for the inflammation and suppuration, if not even the slight sloughing which may ensue, will remove this without further trouble, whilst cutting away the *urethra* is more likely to do harm than good, by increasing the cavity to be filled up, and consequently affording more opportunity for burrowing pus. If the fistula have been of long standing, it may be necessary to brush its surface over with caustic, to destroy its mucous character.—J. F. S.]

967. In a *fistula of the urethra or bladder, communicating with the rectum*, (*Fistula recto-urethralis et vesicalis*,) and consequent on wound, as in cutting for the stone, puncturing the bladder through the *rectum*, in rough catheterism, or long continued in-lying of the catheter in the bladder, from foreign bodies in the *rectum*, or from suppuration, especially in old persons, and the like, the urine mostly escapes by the *rectum*, which causes inflammation and excoriation, and an evil reaction upon the general constitution; or on going to stool, some thin fæcal matter, often only wind or apple or grape-stones, even cherry-stones, which I have noticed in one case, pass through the *urethra*. If the fistulous opening be neither large, nor of long standing, and the constitution of the patient not bad, nor himself old, it may be hoped that by the continued in-lying of an elastic catheter unstoppled and properly fastened, by placing the patient on his side with his buttocks raised, by constantly emptying and cleansing the *rectum* with clysters, by observation of great quiet and a strengthening regimen, the closure of the fistula may be effected. This, however, rarely happens, specially in old persons. If this fistula result from wound of the *rectum* in cutting for the stone, so is its division from the point of injury to the end of the *rectum*, its most proper treatment (1). DUPUYTREN (*a*) has in recto-vesical fistula effected complete cure, or at least considerable improvement, by applying the actual cautery and caustic remedies; in which he introduces his *speculum ani* (a metallic ring) well oiled into the *rectum*, seeks for the seat of fistula, and then introduces the cautery into the fistula, even to the bladder. The lunar caustic is to be used in the same way. After forty-eight hours, the cauterization is to be repeated. In the interum, attention must be paid to the removal of the urine and fæcal matter by cooling diet, by the careful use of soothing clysters, and by the introduction of an elastic catheter into the bladder. Five or six cauterizations are often sufficient to improve the ailment, so that the escape of the urine is much diminished. The application of caustic may be avoided by cutting the *sphincter* muscles on one or both sides (JAEGER).

(1) DESAULT and DUPUYTREN have employed this mode of treatment with good result. ZANG (*b*) considers it preferable to the division of the gut; I have not, however, seen any cure result from it, I have seen a case in which, after the operation

(*a*) AMMON Parallele der franzôsischen und deutschen Chirurgie. Leipz., 1823, p. 111.
(*b*) Above cited. vol. iii. pt. ii. p. 230.

for the stone by another surgeon, the fistula withstood this treatment with the inlying of the catheter, but after a year and a-half, healed of itself.

In a recto-urethral fistula Astley Cooper (*a*) made a cut upon a staff introduced into the bladder on the left side of the *raphe* till he felt the bulb, then thrust a double-edged knife into the *perinæum*, between the prostate and *rectum*, so as to divide the fistulous opening, between it and the *urethra*.

[I have once operated for recto-vesical fistula with considerable benefit to the patient, and I think, had he allowed the treatment to have been persisted in, that he would have been perfectly cured. The object of my operation was, by dividing the *m. sphincter ani* from the fistula into the *perinæum* to produce perinæal fistula, which would be much more easily managed; and I had hoped that the circular fibres of the *rectum* above the divided *sphincter* would assume the function of a *sphincter*, and thus retain the stools. How far I succeeded, the following recital will show; and I have been induced to give it at length, as it well shows the distressing circumstances attendant on cases of this kind.

Case.—S. B., aged 32 years, a labourer of temperate habits and healthy, but very excitable, and subject to occasional attacks of *dyspepsia*, was admitted into Isaac's Ward *Oct.* 3, 1837. Seventeen years before he was cut for the stone by the lateral operation, and the rectum wounded in cutting into the staff. This did not seem to interfere much with his recovery, as a fortnight after the operation he was sitting up in a chair and able to help himself at a pump, but in doing this he found his trowsers wetted by the flow of urine through the *rectum*. When he got sufficiently well to move about, he could never pass his water, whilst in the upright posture, without wetting himself, as the urine passed more freely by the *rectum* than by the *urethra*. Since the operation he has never been capable of retaining his urine beyond two hours, more commonly for not more than one, and occasionally for a still shorter period. At times all the water is voided by the *anus*, and not more than a drop or two by the *urethra*. Between five and six months after the operation he first observed fæculent matter in small quantities to pass from the *urethra*, whilst attempting to make water, in the erect posture, and at the same time pressing on the *anus* to prevent the escape of the urine through it. Ordinarily when he is costive, the motions pass in small bits from the *anus*, and small pieces about the size of peas, and occasionally longer, on an average, about a tea-spoonful, are daily voided by the *urethra;* but this rarely continues for more than a day or a day and a-half at a time. Ever since the operation, he has been much troubled with wind of which night and morning he passes considerable quantity, which, collecting in the bulb, produces great pain till voided by the *urethra*. He always passes much mucus by the *rectum*, and sometimes also from the *penis*. Occasionally after connexion, he has observed a little moisture about the *anus*, with the usual sensation of water passing by it. The fistulous opening is sometimes sore, especially when the bowels are much relaxed, and then stools and urine mixed pass like pease soup from the *urethra*. About four times within the last eleven years there seems to have been a gathering for about a fortnight, during which no wind passed by the *urethra*, and he suffered great pain till the wind again escaped. This was soon followed by blood and pus, after which he got better and went about as usual. He now never leaves his bed without it being wet, the urine having flowed unwittingly through the *anus*, as he supposes; and, in making water he is obliged to sit on a chamber-pot, to avoid the inconvenience of the water streaming down upon him. Occasionally he has heat at the lower part of the *rectum*, hardly amounting to scalding, and he thinks that in the last four years the quantity of stool passed by the *urethra* has increased. When a catheter is introduced through the *penis*, the point passes directly into the *rectum* by a narow slit, about an inch and a-half long, immediately above the *m. sphincter ani*, unless by the finger previously placed in the gut, the tip of the instrument be lifted up and prevented entering. On consulting with my friend Green, whose patient he was, it was determined that I should perform the following operation on.

Nov. 18. Having bound him and placed him on the table, in the same posture as that for the lateral operation for stone, the forefinger was introduced by the *rectum* into the fistulous orifice above the *sphincter*, but its tip only could penetrate into the cavity of the bladder, after passing for about an inch seemingly along the opened

(*a*) Above cited.

under-surface of the prostrate part of the *urethra*. A staff was then passed by the *penis*, and its tip having been tilted by the finger into the bladder, was held as in the operation for the stone. A curved blunt-pointed bistoury was next passed on the finger into the *rectum*, and thence into the fistulous opening till its extremity lodged in the groove of the staff, towards which having turned its edge I cut through the *sphincter* by drawing the knife to the *perinæum*, and then removing the staff, the finger readily entered the bladder. For the purpose of obtaining a complete view of the fistulous opening, WEISS's *speculum vaginæ* was passed into the *rectum*, and the aperture was then found to be an inch long, and half an inch wide, with a rounded and very thin edge; but it was requisite to continue the opening of the *urethra* still more forward into the *perinæum*, before the fistulous opening was sufficiently exposed to permit the paring of its edge. I first, however, separated each side of the wound in the *rectum*, from its connexions with the neighbouring parts, which on the left side, where the cut in the former operation had been made, was of a gristly hardness. The bleeding from these edges was free, a vessel or two required tying, but they continued oozing freely, and were only checked by repeated bathing with cold water. The upper part of the fistulous aperture was then seized with LISFRANC's tentacles, drawn down, and about half an inch of it cut off, which was followed by free bleeding, probably from the veins at the neck of the bladder. The sides of the upper part of this wound were then brought together with a single interrupted suture, so as to shut off the communication between the bladder and *rectum*; but the lower part was left alone, the object being to endeavour to establish a fistulous opening in the *perinæum* as the most likely mode of closing that between the *rectum* and bladder, and to render this more likely, the wound in the *perinæum* was continued forward till the *urethra* was opened as far as its passage through the triangular ligament of the *pubes*. A female catheter was then passed by this opening into the bladder, but as bleeding continued after he was put to bed, it was withdrawn, and having a collar of sponge wrapped round, it was replaced, in hope that the swelling of the sponge would compress the bleeding vessels.

About six hours after the operation, he voided by the catheter some very bloody urine, soon after felt sick and faint, and almost immediately had two gushes of clotted blood, (about half-a-pint), accompanied with air from the *rectum*. He complained of much pain in the loins, and of being distended with wind. As I thought the swollen sponge might have prevented the escape of the air as well also of the blood, and might perhaps be exciting the disposition to bleed, I removed it, and directed that the plug should be removed from the catheter hourly and the water drawn off.

He went on tolerably well except being teased with flatulence and a tiresome cough. On the *third* day the wound began to discharge; he has been passing plenty of clear urine by the catheter, often accompanied with air; but on the day following some was noticed to pass by its side, especially whenever he coughed. On the *fifth* day a small portion of hard stool was passed, whilst he was emptying his bladder, and a considerable quantity of fluid motion was on the sheet. This was the first relief after the operation, for although he had taken a little confection of senna with the view of expelling the wind, it was thought advisable to keep the bowels as quiet as possible. On the *seventh* day he was going on well, still passed air with his urine, but in less quantity. An injection was given this evening to clear the lower bowel, but it had not any result. One ligature came away. On the following evening he had a plentiful solid motion which gave him much pain; his cough having become very troublesome, syrup of poppies and mucilage were ordered. On the *ninth* day the catheter was removed, and having been replaced with a shorter one, four ounces of urine were evacuated without any air, but afterwards both were again passed as usual. On the *twelfth* day he felt much forcing pain as if the bowels were loaded, though he had a good motion last night, and he has twice this morning passed some stool as well as air by the catheter. In the afternoon the bowels were freely moved, after which no more motion passed by the instrument. On the *seventeenth* day a fresh catheter was introduced; and on the *twentieth* he complained of much irritation in the *perinæum*, which when examined appeared to depend on the shoulder of the catheter having caused a little ulceration in the cleft of the buttocks. As regards the parts operated on, the external wound is healing fast, but the fistulous opening does not seem much altered. The catheter was removed, and an elastic male catheter passed by the *penis* to encourage the healing of the perinæal wound. This did not answer the purpose so far as the relief of the bladder was concerned; for the urine did not pass through it, but some by

its side, through the *urethra*, the greater quantity however escaped by the *rectum*. On the evening of the *twenty-second* day, not a drop of urine having passed through the catheter, the dresser thinking it might be stopped up, and that there might be retention, withdrew it, and introduced a silver catheter; but very little water having been obtained, he replaced the elastic catheter, through which, since the urine flowed freely, and on the *twenty-fourth* only passed into the *rectum* whilst he evacuated his bowels. On the *twenty-ninth* day his bowels having become loose, the catheter began to slip into the *rectum*, and have stools pass by it. This continuing for several days, the catheter was entirely removed, after which he began to pass about a table-spoonful of urine, at each watering, by the *penis*, but the greater part escaped by the *rectum*. For the first two hours after taking drink, he was making water every two hours, but after that time much less frequently. After *two months* he began to get up; he now retains his water for an hour and a-half or two hours, but voids it both ways. Four days after the water was held for a longer time, did not pass off as he walked about, but after sitting it oozed from the *anus* when he got up. He still continued slowly and steadily mending, the quantity passed by the *urethra* being equal to that from the *rectum*. In the *thirteenth* week I examined the parts with a *speculum*; the fistulous opening is about three-eighths of an inch in extent, its edges perfectly scarred and puckered. For the purpose of inducing contraction, lunar caustic was freely applied. During the following week more urine passed by the *urethra*, and the edges of the wound were again touched with the caustic. Subsequently, at intervals of about a week, the edge of the aperture was continually touched with the nitrate of silver, and at the end of six months when I again examined the *rectum*, the fistulous orifice had diminished to the size of a large goose-quill, but he still passed water by it, though varying in quantity. Soon after he left the house much relieved, but not cured by the operation, and I have since lost sight of him.—J. F. S.]

968. *Vesico-vaginal Fistula* (*Fistula vesico-vaginalis*) is almost always the consequence of inflammation and sloughing of the *vagina* in difficult labour with the head long wedged, or of instrumental delivery, in which the fistula may be produced in from twelve hours to fourteen days after the separation of the slough; more rarely it occurs from injury of the front wall of the *vagina* and of the bladder, by instruments or sharp bones in opening the head; from operations, as lithotomy and puncture of the bladder by the *vagina*, from ulceration of the bladder by the continual pressure of a catheter, or of a rough angular stone, from ulceration of a mucous bag, (Dieffenbach), and the like. The fistulous opening therefore mostly depends on loss of substance. The inconveniences are very great; the *vagina*, *nymphæ*, *labia*, and the inside of the thighs, are considerably inflamed, excoriated, studded with pustular eruption, burn and smart from the urine escaping by the fistula and the *vagina*. Often a stony mass collects between the *labia* and *nymphæ*, and excites much pain; on account of the patient's continual wetting and the soaking of her clothes, her position and so on, a very offensive smell spreads about, which cannot be avoided by any precaution, or by the most exceeding cleanliness, renders her neighbourhood, in the highest degree troublesome and unbearable, and banishes her to the most painful isolation. The bladder gradually loses its capacity, and the *urethra* becomes narrow.

969. The *diagnosis* of the fistula is always easy, on account of the mode of its origin and the symptoms mentioned, and is most distinctly determined by examination. If the fore-finger be introduced into the *vagina*, a very large opening is most commonly found in the middle of its front wall, from the size of a bean to two inches and more, the direction of which is mostly transverse, rarely vertical; but of the latter at least I

have never seen an instance. According to the different size of this opening it may be felt merely with the finger, or seen on examination with the *speculum vaginæ*, or it may be penetrated by the fore-finger, or by several fingers into the bladder. With so large an opening it is usual for the fore part of the bladder to protrude as a reddish bladder-like swelling into the *vagina* or between the *labia*. The aperture is situated for the most part an inch above the orifice of the *urethra*, but it may be higher or lower; it may correspond to the *urethra*, in which case the urine will be passed voluntarily, and escape only in part by the fistula. Stones may escape by the fistula, and incrustation form upon the internal surface of the bladder, (Jaeger), as well also as in the *vagina*. The canal of the *vagina* above the fistula may be natural, or, as I have often found it, narrowed by adhesions in various ways, and even entirely closed; the neck of the wound is often drawn awry, nearly destroyed, and the mouth of the womb itself grown together.

970. The *prognosis* in vagino-vesical fistula is always very unfavourable, inasmuch as the continual wetting of the fistulous edges with urine prevent it closing; this, however, must always be attempted, especially when the opening depends on considerable loss of substance. Although of late the numerous attempts to cure these fistulas have presented only some successful cases, yet in the very sad condition in which the patient is placed by this fistula, and in the inadequacy of palliative remedies by means of receptacles for the urine, and so on, the further perfection of this treatment is to be considered as most highly important and to be desired.

The various urinary receptacles which have been proposed by Dzondi, as well as the obturators of Barnes, Schmitt, Burkhard, Earle and Duges, by means of sponge and elastic flasks, by cylindrical or other shaped pessaries, or by means of a piece of gut filled with air, are either of no effect or improve the condition of the patient very little. I have only once succeeded by the aid of an elastic bottle, upon which a sponge was fastened to retain the urine, so that in standing or walking it did not escape, and could be voluntarily discharged.

971. The *cure* of vagino-vesical fistulas has been attempted in various ways:—1st, *By drawing off the urine, and compression of the fistula;* 2d, *by cauterization;* 3d, *by stitching;* 4th, *by the uniting apparatus;* and 5th, *by transplanting skin.*

972. For drawing off the urine, a sufficiently large elastic catheter should, according to Desault (*a*), be introduced into the bladder, fixed to an apparatus resembling a truss by means of a moveable silver plate, provided with an aperture for the removal of the catheter; and to bring together the edges of the fistula, a tent of linen, or a sort of glove-finger stuffed with lint and smeared over with resin or wax; or a bottle of elastic resin, on the front of which a thin piece of sponge is sown, dipped in oil, and the sponge smeared with *cerate. calam.* (Baines) (*b*); or a sponge, (Guthrie), or an elastic oval pessary, (Rognetta), or a hollow resinous cylinder, (Coxe), introduced into the *vagina*, which it fills up, but does not stretch. During this treatment the patient must avoid lying on her back; and the cure is rarely effected before six or twelve

(*a*) Above cited.

(*b*) Case of the succesful treatment of Incontinence of Urine, consequent to sloughing or ulceration of the bladder from injury during labour; in Med.-Chir. Trans., vol. vi. p. 582.

months. Although by this method several successful results have been obtained (*a*), in most cases it does not succeed, especially if the fistula be old, callous, and round; by the frequent removal of the plugs from the *vagina* the cure is always disturbed, and the length of time it requires, in many cases cannot be borne. JAEGER doubts the cures of old fistulas by this treatment, as mentioned by DESAULT.

973. On the failure of this treatment, for the purpose of effecting the cure most effectually, and in the shortest time, the cauterization of the edges of the fistula with caustic or with the actual cautery has been practised, in order by the inflammatory swelling, suppuration and granulation, to effect its diminution and gradual closing. DUPUYTREN (*b*) introduces his *speculum*, open above, into the *vagina*, with its aperture upwards, and then with a hot iron, or with a piece of nitrate of silver or caustic attached to a thin rod, touches the orifice of the fistula for a minute, after which lukewarm water is to be injected. Often a similar application is necessary in from five to eight days. The position of the fistula may be illuminated by a candle held before it (*c*). LALLEMAND (*d*) first takes an impression of the fistula with modelling-wax, for the purpose of fully understanding the extent of the opening, and its distance from the entrance of the *vagina*. Afterwards he carefully touches the edges of the fistula with nitrate of silver, by means of a caustic-bearer fixed on a ring, and thus produces a sufficient degree of inflammation. When the slough is thrown off, and the edges of the fistula have become red, swollen, and suppurating, he introduces his connecting catheter (*sonde-airigne*), which draws off the urine from the bladder, and at the same time holds hooks, which are fixed in the hind edge of the fistula, whereby the two fistulous edges are brought together and kept in contact. If one application of the instrument be not sufficient, it must be repeated. The changed condition of the fistulous opening, and its progressive scarring, is ascertained by the repeated application of the modelling wax. Cauterization can specially have only a satisfactory result when the fistula is small and surrounded with much harshness, and especially, according to DIEFFENBACH, if it be high up in the *vagina*, where the suture is inapplicable, and the neck of the womb participating in the burning, and thereby swelling assists the union.

SANSON describes a peculiar apparatus for illuminating the *vagina* after the introduction of the *speculum*.

DUPUYTREN has also a connecting catheter, projecting wings on both sides instead of hooks. NAEGELE's and LAUGIER's connecting forceps.

974. Sewing up the vesico-vaginal fistula, after having previously refreshed its edges according to the proposal of ROONHUYSEN (*e*), as practised by FATIO (*f*) and VOELTER (*g*), but not since thought of, and in

(*a*) DESAULT, BARNES, YOUNG, GUTHRIE, (Edinburgh Medical and Surgical Journal, 1824, April,) BRETSCHLER and others.

(*b*) AMMON, above cited, p. 114.

(*c*) SABATIER, Médecine Opératoire.—Nouv. Edit., vol. i. p. 49.

(*d*) Réflexion sur le Traitement des Fistules Vesico-vaginales nouveaux moyens d'union applicables à celles dans lesquelles la perte de substance est considérable; in Archi ves générales de Médicine, April, 1825, p. 481, pl. i.—FRORIEP's Notizen, No. 232, p. 186.—Chirurgische Kupfertafeln, pl. clv.

(*e*) Heebkonstige Anmerkingen. Amst. 1663.

(*f*) Helvetisch vernünftige Wehmutter. Basle, 1752.

(*g*) Neue eröffnete, Hebammenschule Stutt. 1722.

which NAEGELE (*a*) proposed different modes of proceeding, SCHREGER (*b*) followed out successfully, has been frequently of late, and with various modifications, performed, but rarely with success. WUTZER (*c*) has had the greatest success, (of eighteen operated on, three were radically cured and the rest improved), who, by the careful and precise detail of his observations and trouble, accompanied with rare perseverance, has importantly contributed to perfecting the operation, and, by the addition of *paracentesis vesicæ*, in order more completely to draw off the urine, has advanced considerably farther than his predecessors. The performance of the operation for vesico-vaginal fistula is always difficult, and may be even dangerous, from severe inflammation of the bladder and *peritoneum*. The difficulty of the operation is increased by the high situation of the fistula and by the narrowness of the *vagina;* so also the improbability of its success is in large openings with thin edges, with the whites, with the urine not properly drawn off, and in a bad constitutioned patient. If there be adhesions of the *vagina* these must be first divided, and any incrustations in the *vagina* or bladder removed. If the patient still menstruate, the operation must be undertaken two days after it has ceased. The intestinal canal must be cleansed by purging or clysters. According to WUTZER, the operation is only to be undertaken in fine weather.

975. The patient should be placed on her belly upon a table covered with a mattress, so that she may kneel near its edge, with her head and chest bent forwards, and supported with small bolsters. The operator sits between the patient's thighs, upon a seat of proper height, so that his arms should not soon tire. To widen the *vagina* and render it sufficiently open, a blind hook should be introduced into it, and the *perinæum* raised with it, by an assistant. The *labia*, together with the sides of the *vagina*, are to be drawn outwards by other assistants, standing on either side, either with the fingers alone properly applied, or with slightly bent hooks.

The position of the patient on her belly is much preferable to that on the back, (as in the operation for the stone), which has been recommended by most persons, as the performance of the operation is rendered considerably easier, although for the patient it is more irksome than on the back. The widening of the *vagina* with a *speculum* in the way proposed, is also preferable. (WUTZER).

976. According to WUTZER's method for refreshing the edges of the fistula, the most conveniently situated part should be seized with a long-stemmed slightly curved sharp hook, and brought into a suitable position; a line is then to be drawn with the point of a fine pointed scalpel around the fistulous opening, and from three to four lines distant every where from it. The portion of the mucous membrane of the *vagina* between the line and the fistulous opening is then to be seized with the hook somewhat raised, and gradually removed about the whole extent of the opening as thinly as possible, to the breadth of three or four lines, by a saw-like motion of the scalpel, and the bleeding which ensues is to be checked by the injection of cold water.

(*a*) Erfahrungen und Abhandlungen aus dem Gebiete der Krankheiten des weibl. Geschlectes. Mannheim, 1812, p. 369, vol. i. ii.

(*b*) Annalen des chirurg. Klinikums auf der Universität zu Erlangen. Erlangen, 1817, p. 78.

(*c*) Ueber die Heilung der Blasenschiedenfistel; in Organon für die gesammt Heilkunde, vol. ii. pt. iv.—F. BÜTTGENBACH, Dissert. de variis fistulæ vesico-vaginalis operandi methodis. Bonn., 1841.

By Dieffenbach, the patient is put in the same position as in cutting for the stone, a silver catheter is introduced into the bladder and held by an assistant, and a two-armed *speculum vaginæ* passed, in order to see the fistula distinctly. If the fistula be not high up, one of its edges may be seized after another, with a hook, or with a pair of hooked forceps, gently drawn down, and removed with a proper bistoury or pair of scissors. If the fistula be high up, Dieffenbach, after introducing Ricord's *speculum*, passes one pair of hooked forceps into the wall of the *vagina*, above the fistula, and a second pair of hooked forceps beneath it; the *speculum* is then removed, and the *vagina* gently drawn with double hooks, if there be considerable tension, by an assistant, to one side, till the edges of the fistula are apparent between the *nymphæ*. About the edges little hooks are to be introduced, and both double hooks and one pair of forceps removed; the other pair is held by an assistant, and the little hooks by another person. A small scalpel is now thrust through the mucous membrane of the *vagina* and bladder, distant a line from the fistulous aperture, and a strip, a line broad, is to be removed around the opening, and the hooks again introduced into the bleeding edges. The edge of the bladder is now to be taken hold of with a fine pair of hooked forceps, and a portion, two lines wide, removed with the knife, so that the wounded surface, which was only one line wide, is now four lines. In small fistulas, where the separation of the two walls is not possible, a funnel-like piece should be removed.

Hobert (*a*) refreshed the edges by touching with lunar caustic.

Peculiar instruments for refreshing the edges (Naegele's bistoury with a covered edge, Lallemand's hook-shaped knife, and so on) are unsuitable and unnecessary.

977. For uniting the refreshed edges, the twisted, the glover's, the interrupted and the running stitch have been proposed, and with different modifications employed; the twisted and the interrupted are most convenient. The latter is easier of application; soft threads only and not hard metallic threads being employed, the threads are easily withdrawn; on the other hand the twisted suture renders the union much closer and does not allow the urine to percolate so easily; therefore Wutzer prefers it, in a quiet intelligent patient, for a narrow *vagina* and soft fistulous edges. In using the twisted suture, the insect-needles should be fresh sharpened and pointed, just before the operation, but they must not be too fine. The needle in the needle-holder should be introduced at such an angle as suits generally the position of the fistula; its point should not project farther than necessary. It may be requisite, in order that the movements of the needle be not prevented, to grip it with the needle-holder close to the head. The tip of the fore-finger of the left hand is to be placed near the edge of the fistula, and so directed that the entrance of the needle should be as advantageous as possible. In transverse fistula it is best to pierce the hinder (upper) lip of the wound first, but in longitudinal fistula that next the left side of the *pelvis*. The left fore-finger then presses the corresponding lip of the wound against the point of the needle, till it pretty well holds it. The other needles are to be introduced in a similar way, and the distance between the several needles should be no more than two and at the farthest three lines asunder. The tying of the threads

(*a*) London Medical Journal, 1825, Dec. p. 439.

is to be effected with the two fore-fingers, but if they cannot reach, with the forceps. In the application of the interrupted suture, the curved needle, properly fastened in the needle-holder, and supported by the left fore-finger is to be thrust through both lips of the wound at proper points; for which purpose, frequently the edges of the wound must be fixed with a sharp hook, as otherwise they easily give way. As soon as the needle is introduced through both lips up to its eye, an assistant frees it by turning back the screw of the needle-holder; the eye and the thread are then to be oiled, the holder withdrawn, and the point of the needle seized with the forceps, and about eight inches length of thread introduced. Both ends of the thread may be advantageously used for arranging the edges of the wound whilst applying the other stitches. If several threads have to be introduced, it is convenient that they should be of different colour, so that they may be more easily arranged. The needle threads must be first tied and drawn together with the fingers, or if deep, with the forceps. If the first tie loosen before the second is drawn together, it must be kept tight with forceps by an assistant. The threads must be cut off an inch from the knot. In introducing the needle it should be remembered, that the edges of the wound are to be taken hold of so far from the needle, that they may be penetrated *without ever* piercing the mucous membrane of the bladder. By this treatment the two wounded surfaces are applied to the height of three or four lines, and their free edges at the same time turned inwards towards the bladder, permit the urine to come in contact with the seam only in the most untoward cases. In this way, according to Wutzer, the very difficult separation of the bladder from the wall of the *vagina*, which here and there, from the great thinness of the tissue, must be quite impracticable, is superfluous. Dieffenbach draws with curved needles seven threads from the hinder to the front end of the fistula when drawn down, of which only one holds the edges of the *vagina* and the other, those of the bladder. The threads which have been passed are to be properly tied with the fingers, their ends brought out and fastened in the *mons Veneris* with sticking-plaster.

The twisted suture is proposed by Naegele to be made with curved needles; Roux employs the common hare-lip needles; Schreger uses the glover's needles and suture. Ehrmann (*a*) first introduces on the inner side of the fistula some cross threads, then scarifies, and brings it together by tying the threads. Kilian so introduces the needle near the front angle, three lines from the edge, that its convex surface is directed towards the operator, pushes it backwards in the direction of the length of the fistula, and again passes it out at the same place, draws it out with the forceps, and brings back the threads to this side. In this way the threads are introduced on the other side, by which the first thread may be employed for drawing down the fistula. The several opposite corresponding threads may then be tied.

The conveyance of the needle with the fingers, or, where necessary, with a needle-holder, is preferable to the long stemmed trocar-like needle, from the eye of which the ligature is drawn out with a pair of forceps. (Naegele, Lallemand, Deuber, and others). The drawing together of the threads, by passing them through several rosary beads, and tying upon them, (Schreger), or with the ligature tyer, is improper.

For the cases in which, on account of the thinness of the fistulous edges above described, the separation of the *vagina* from the bladder is not possible, Dieffen-

(*a*) Répertoire Générale d'Anatomie et de Physiologic Pathologiques, vol. v. pt. ii. p. 172. Froriep's chirurg. Kupfertaf. ccxxxv.

BACH recommends the running stitch, in which without previously refreshing the edges, a very thick thread is carried by a curved needle circularly around the fistula, some lines distant from its edge, through the cellular tissue connecting the *vagina* with the bladder, in which the needle must be passed in and out three or four times through the same opening; the thread is then to be firmly tied. (Compare *par.* 957).

978. For the purpose of carrying off the urine with greater certainty from the wound thus brought together, puncture of the bladder above the *pubes* should, according to WUTZER, be performed. The patient must be removed from the position upon her belly to that on her back, and should be allowed some rest. She is then to be brought to the edge of the table, the thighs raised towards the belly, and after the still remaining urine is drawn off with an elastic catheter, the curved tube of the trocar furnished with a fishbone-plug, and oiled, is to be introduced through the urethra into the bladder; the round head of the plug is then placed against the front wall in the direction towards the arch of the *pubes*, pressed pretty firmly on the hind surface of the lower notch of the *synchrondrosis*, and there kept some time constantly close to the pubic *symphysis*, raised along it from below upwards. till at last it can be felt through the abdominal coverings immediately above the *pubes*, and *directly in its middle*. The operator then firmly retains the tube in his right hand, in the position just mentioned, places the tip of the forefinger and thumb of his left hand on either side of the projection artificially made above the pubic *symphysis*, and endeavours so to assist in fixing the extremity of the tube there pressed up; an assistant then withdraws the plug, and in its stead introduces a curved stilette into the tube, so far upwards till the two handles completely meet to each other, and the point of the stilette at the same time protrudes through the upper opening of the tube. At this important moment the operator with his right hand takes hold of the handle of the tube with that of the stilette, and with strong pressure thrusts the stilette in a corresponding direction upwards and forwards, through the front of the bladder and the wall of the belly. The accompanying tube he takes hold of at the same time, with the two fingers of the left hand conveniently disposed, keeps it steady, and then allows the stilette to be withdrawn by an assistant, who also immediately carefully removes the handle of the tube, by gently drawing them apart. The operator now changes both hands, draws the tube with his right hand out of the belly till the hinder extremity directed by the left hand enters the cavity of the bladder, between the orifices of the ureters, which can be ascertained by the careful introduction of the oiled tip of the finger into the *vagina*. For the purpose of keeping the tube in this position, it must be fixed immoveably by means of wing screws, in the cleft of a previously well-fitted belly-girdle, after which the patient should be carefully conveyed to a bed previously prepared, placed on her belly, upon suitably cut out leather cushions, and properly buckled in it with suitable straps. In the gap of the bolster and beneath the point of the tube a basin should be placed to receive the urine flowing from it.

For the arrangement of the trocar and bed, see WUTZER, above cited, pl. iv. and v.

979. The *after-treatment* must have special reference to the pre-

vention of inflammation. According to Dieffenbach, besides rest and antiphlogistic diet, injections of cold water every half hour, with a large syringe, through the catheter lying in the bladder should be made, and by an *œsophagus* tube into the *vagina;* cold application on the region of the *pubes*, and according to the state of the constitution, blood-letting; if pain come on, leeches to the region of the bladder, and even in the *vagina;* emulsions with *aqua lauro-cerasi* and castor oil, with mucilaginous drinks. About the sixth day the ligatures are to be carefully removed with forceps and long scissors, and injections made with luke-warm chamomile tea. If the union succeed and there remain only a little opening in place of the early cleft, or one of the needle-holes, we must endeavour to close it, by touching with tincture of cantharides, and the like, or by the loop suture. According to Wutzer, the symptoms of inflammation coming on moderately, may be opposed by frequently drinking cold water, and careful injections. In more careful examination of the patient, together with the application of leeches, some doses of calomel, rubbing in gray mercurial ointment on the insides of the thighs, and the frequent introduction of small pieces of ice into the *vagina* may be sufficient against severe inflammatory symptoms. The latter remedy employed with a cautious hand, will be especially advantageous and diminish the still burning pain. In increased inflammatory symptoms, blood-letting, calomel followed with infusion of senna, and injections of luke-warm oil into the *rectum* are to be employed. When, however, there is no danger of threatening symptoms, constipation for four or five days is rather desirable, and if there be disposition to *diarrhœa*, it must be checked with opium. If the puncture of the bladder have not been made, or if the tube have again slipped from the bladder, a thin elastic catheter must be introduced through the *urethra* every hour or two, or even oftener, with frequent pressure to discharge the urine; Wutzer considers it most advantageous when the patient herself can do this; but if not, the introduction of the catheter must be carefully performed by an assistant; and only when neither is possible, should the catheter be allowed to remain permanently. When, however, not merely the disposition to inflammation of the bladder is much increased, but also, by the continued irritation, the mucous secretion in the bladder is so great, that particularly after the third day, the catheter is frequently stopped, against which injections are not sufficient, this instrument must often be changed. The sutures should be first examined three days after the operation; if about this time a needle or a thread be near cutting through it, must be removed. After the third day, the examination must be made daily, that according as suppuration comes on, the several threads or needles may be removed. In successful cases the scar acquires the desired strength in four days. After the removal of the threads or needles, injections only of luke-warm water, or of weak lead wash should be used.

980. The cure of vesico-vaginal fistula by *transplantation*, was first attempted by Jobert, in a case where previously two attempts with suture had failed. By means of Museux's forceps or a hook, he drew down the hinder edge of the transverse fistulous opening, pared it, and then did the same with the front edge. He next separated an oval piece

of skin from the mucous membrane of the right *labium*, so that the flap at the edge of the vaginal aperture formed, by closing the cut, a neck of four lines broad. With a female catheter, he introduced a loop of thread through the *urethra*, up to the fistulous orifice in the *vagina*, and drew the one end of the loop out of the *vagina*, and the other by the catheter, out of the *urethra*. The turned back flap was so folded, that its mucous surface touched itself, and through its double edge the end of the thread hanging out of the *vagina* was passed spirally with a needle twice, and so a plug of flesh formed with a raw surface. By drawing the end of the thread hanging from the *urethra*, the fleshy plug was pulled between the fistulous edges and properly pressed up with the finger. An assistant continued to draw the urethral end of the loop, whilst the operator, after refreshing, drew a thread forwards which had been introduced into the upper edge of the fistula, for the purpose of bringing it into contact with the flap of flesh. An elastic catheter was then introduced into the bladder, the ends of the thread fastened to a T-bandage, (or with sticking plaster on the thigh,) and the wound covered with agaric. The patient was benefited, but not cured.

In another case, in which the transplantation was made from the *labium*, hair subsequently grew upon it, which excited inflation of the mucous membrane of the *vagina*, and obstructed *coitus*.

Subsequently Jobert made the flap from the fold between the thigh and buttock; after ten or eleven days the patient could pass her water without the catheter, in the usual manner. After four or five weeks the flap was cut through, an inch from its base, whereupon it became black, which, however, it ceased to be, after throwing off a small slough. After two months the successful result is no longer to be doubted. For similar experiments on transplantation see Wutzer, above cited.

981. Dieffenbach endeavoured to close large fistulas by drawing the mucous membrane together. Without introducing a *speculum*, and after having returned the wall of the bladder through the fistula, and having introduced a sponge into the cleft, to prevent its re-protrusion, he seized one edge of the opening with the hook-forceps, drew it towards him, and supporting it with another hook, cut off a narrow slip from the edge, and also cut off the edge of the bladder, some lines distant from the edge of the *vagina*. He then, by means of his own palate-needles, carried two leaden threads through the edges of the *vagina*, without including the bladder, and drew them together till there was considerable tension, upon which he thrust the knife in upon the posterior and lateral part of the *vagina*, and drew it down in a straight line to the *nympha*, and then treated the opposite side in the same way, so that the breadth of the thus isolated part of the *vagina* was about a fourth of its whole width. In making this cut the finger was introduced into the *rectum* to prevent injuring it, and to make the cut sufficiently long and deep. The leaden thread being then drawn tighter till great tension was again produced; the edge was drawn forward with a hook, or with hook-forceps, and the cellular tissue connecting the *vagina* to the pelvis cut through with scissors or a knife, first on one and then on the other side, but without coming too near to the bladder. By continuously drawing the leaden threads, the edges were loosely brought together, so that no further tearing apart was to be feared, and the edges of the wound were united with the interrupted suture, made with a curved needle, and when the hindmost stitch could not be made with the hand alone, it was made

with a needle-holder. When the whole cleft was closed the leaden threads were drawn close together, and cut off so that only two turns remained. A catheter with large openings on the sides was introduced, and the after-treatment conducted as above described.

In moderately large fistulas, when a small neighbouring fold of the bladder lies in the opening, and has already become adherent, DIEFFENBACH recommends that the edges should be inflamed, by frequently touching with *tinct. lyttæ*, and that the membrane of the bladder should be drawn with a fine hook into the opening. If at last it unite to the edge, its surface should be touched with lunar caustic, to render it more tough and hard.

There is still to be mentioned VIDAL's proposal of, in complete destruction of the *vagina* and wall of the bladder, bringing together the *labia*, having first pared them; after which care must be taken, by frequent introduction of the catheter, and, in menstruation, by injection, for clearing the urine and blood from the *vagina*. To the same purpose is HORNER's proposal (*a*) of drawing down the *uterus* into the *vagina*, and so to fasten its front that it may supply the loss of the bladder or its neck.

[Among the various plans of treating vesico-vaginal fistula, may be mentioned that of introducing a small India rubber bag into the bladder proposed by Dr. KEITH of Aberdeen (*b*), in consequence of the following very remarkable case which came under his care.

Case.—J. S., aged thirty years, was admitted into the Aberdeen Infirmary, complaining of constant pain in the region of the bladder, and constant distillation of urine from the *vagina*. She was delivered in 1831 by the forceps, and fourteen days afterwards the urine came away through an artificial opening in the *vagina*. This continued for seven or eight years, when she plugged the opening with a pint-bottle cork, and for a time succeeded, and she enjoyed comparative comfort till the cork slipped into the bladder, and was followed by the usual symptoms of stone. For a time the urine flowed again through the fistulous opening, but as the symptoms of stone became aggravated she regained the power of retaining her water, and this so entirely before the close of the year that she then passed the whole of her urine by the *urethra*. The irritation of the stone however became so intolerable that it was resolved to crush it by the screw lithrotite. The fistulous opening was then large enough to admit a No. 16-catheter, having once been large enough to admit a pint-bottle cork. When the stone and cork had been crushed, and the particles evacuated the urine again passed freely through the fistulous opening, which, however, had become sufficiently small to allow a button-headed cautery at a white heat to be applied to it, so as to touch at once the edge all around. This was repeated in six days, again in sixteen days, and lastly in twenty-two days, after which she continued quite cured. "Several points of interest attach to this case," says KEITH; "*first*, it affords convincing evidence, from the effect produced on the fistula by the presence of her calculus that were a foreign body of a smooth and unirritating character, of sufficient weight, introduced into the bladder in cases of vesico-vaginal fistula, the body would act as a bullet valve, and not only keep the patient dry, but actually *favour* the contraction of the false opening. After seven years, in the above case, the opening admitted a pint cork, with so much ease that it slipped through but after a foreign body was lodged in the bladder, nine months sufficed to reduce the opening to less than one-third of its previous size, and it could only have been during the latter six months of that period that the cork could have acquired density and weight enough to operate as a valve-plug. I would suggest a small thin bulb or bag of Indian rubber filled with mercury. Should incrustation happen in the progress of the cure, a squeeze with a screw lithotrite, or percussor, or a long *œsophagus*-forceps would throw it off, and at last when the opening had contracted to such a size as to admit of its ready cure by the cautery, the thin bag could be easily burst or punctured, and then withdrawn by the *urethra*. *Secondly*, If asked why I deprived myself of the bullet valve, while cauterizing in the above case? I reply, that the constant straining kept up by the rough stone, arising from the inflamed state of the mucous membrane of the bladder, kindled and kept up by its presence, obliged me to remove a source of irritation, sufficient to defeat, in more ways than one, any effort of mature adhesion. *Thirdly*, It is worthy of remark that the application of

(*a*) American Journal, 1839. No. 7.

(*b*) Remarks on the Treatment of Vesico-vaginal Fistula; in London and Edinburgh Monthly Journal of Medical Science, vol. iv. p. 12; also in BRAITHWAITE's Retrospect, vol. ix. p. 164.

the actual cautery inside the *vagina* occasions nothing deserving the name of pain, and this observation I have had repeatedly corroborated. The heat of the reflected rays may be felt; but I have never found patients say that they really felt pain. *Fourthly*, It is advised by high authority to allow long intervals between each application of the cautery, that time may be afforded for the consequent contraction of the parts: the advice is judicious; but it applies chiefly to cases where the orifice is large, and where there is much to accomplish in the way of closing in. My bullet-valve will, in future, aid the process much in such cases; but I beg to remark that where we have a fistulous opening of the size of a female catheter, for instance, and where, as in the preceding and succeeding cases, we are able at once to make the edges approximate, then I would urgently advise the frequent use of the hot iron, so as to keep up a raw edge, as well as a complete closure, thereby to ensure adhesion and complete obliteration at once." (p. 13).

[RECTO-VAGINAL FISTULA.

981.* Still more serious and distressing to the patient than the vesico-vaginal, is the *Recto-vaginal Fistula*, *(Fistula recto-vaginalis)*, in which the stools incontinently passing from the *rectum*, through an unnatural passage in the *vagina*, convert it into a *cloaca*, from whence they continually escape by the *vulva*. When from the discharge of stool by this aperture, it is suspected that a fistula exists between the *rectum* and *vagina*, its situation and extent may be ascertained by the introduction of the finger of one hand into the *rectum*, and a blunt gorget into the *vagina;* but if the fistula be very high up, a sound must be introduced instead of the finger; in the latter case, however, Duparcque prefers the *speculum vaginæ*, as by it, every part, even the most minute fold of the *vagina*, can be thoroughly examined. He also observes, that, "injections are not to be despised, as they point out in the fistula, indications which cannot be so exactly determined by any other means. Thus the injection, which does not return by the *vagina* in stercoral fistula, otherwise very evident, shows that it is neither with the *rectum*, nor with the large intestines that there is a communication, but that it belongs to the small intestines. The nature of the matter escaping from the fistula, furnishes also a sign more or less positive of the region of the intestinal canal with which it is connected. Thus the matter is liquid and yellowish from the small intestines; thicker and containing portions of formed motions when the fistula is in the large bowels, and more especially when in the *rectum*. * * * If the gas formed in the small intestines differ materially from that in the large, it may also afford some guide to the seat of the fistula; the patient should therefore be put in a bath, and the gas collected and analyzed." (p. 315). "The tendency to spontaneous cure which exists in accidental openings, is especially remarkable in tearings of the *vagina*. As the neighbouring parts converge concentrically towards the solution, so does it diminish, narrow, and at last the opening entirely disappears. The development of the cellular granulations, which is a sort of lengthening of the tissue, contributes to fill up the space, and especially to form the scar. Thus fistulous openings, of which the size is so great as to do away with all hope of occlusion, are notwithstanding, more or less immediately closed, either spontaneously after all treatment has been given up as unavailing, or when it has been perhaps more injurious than beneficial." (p. 327). A remarkable instance of this kind is mentioned by Duparcque, in which there was one aperture between the *vagina* and *rectum*, an inch and a-half above the

anus, through which the finger readily passed; and a second between the *vagina* and *urethra*, about an inch from the orifice of the latter, of an oblong shape, from seven to eight lines long and two wide. In four months from the delivery, the apertures had diminished to half the size they were of, at the preceding month, when first examined; and at the end of eight months, "nothing escaped into the *vagina*, and there was merely a slight depression indicating the scar of the wounds." (p. 331). The only treatment in this case was great cleanliness, looseness of the bowels, quiet, and generous living.

Duparcque observes, that "the passage of the fæculent matter over these accident alfistulas, does not actually prevent their healing, but because the parts on which they are found are not favourably disposed to stretch by their distension, or displacement, to the concentric closing of the opening. Thus the use of sounds, pessaries, and obturators, produce no satisfactory results; but on the contrary, by keeping the walls of the fistulous organs asunder, they prevent the narrowing of the opening. (p. 331). The passage of the stools over the fistula, is rather advantageous than detrimental to the scarring. In reality, their continual contact with the edges of the opening, excites an inflammation which prevents their scarring simply of themselves; it causes the development of cellular granulations necessary to fill up the space, and produce consecutive union. * * * But I repeat, the principal and most important indication consists in putting the perforated parts in a condition most suitable for the approximation of the edges of the opening. (pp. 132–33).

The principle here recommended was, however, carried out much more correctly in an operation for recto-vaginal fistula, first proposed and performed twenty-five years ago by Copeland, and it is much to be regretted that he has not given to the public any account of it; for though he is well known as having been the original proposer, yet there have been only a few scattered notices of this operation in the works of other writers (*a*). He has, however, kindly informed me, that his first operation was for a recto-vaginal fistula consequent on delivery, and that it consisted in division of the whole *m. sphincter ani*, on *one side of the anus*, so as to produce incontinence of the stools, and quite away from the fistulous opening. The result of this was, that the contraction of the *sphincter* being destroyed, the parts surrounding the fistula were no longer acted upon by it, and the tendency of the fistulous opening to concentric contraction being not opposed, it gradually drew together till it had completely closed, whilst the divided *sphincter* uniting more slowly, at last recovered the power of retaining the motions, and thus a perfect cure was effected. He further informs me, that he has operated successfully five or six times, cutting one or other side of the *anus*, as might be convenient, but never dividing forwards towards the *vagina*, nor cutting through the fistula and *perinæum*, as the result would inevitably be permanent incapability of retaining the stools.—J. F. S.]

Besides the writers already mentioned on Vesico-vaginal and Recto-vaginal Fistula, there may be also compared

Dieffenbach; in Med. Vereinszeitung für Preussen. 1836, June.

(*a*) Mayo Herbert, Observations on Injuries and Diseases of the Rectum. London, 1833. 8vo. p. 23.

Jobert; in Gazette Médicale. 1836, March.
Kilian, Die rein chirurgischen Operationen des Geburtshelfers. Bonn, 1835.
Duparcque, Histoire Complète des Ruptures et Déchirures de l'Uterus, du Vagine et du Périnée. Paris, 1836. 8vo.
Bendz, H. Ch., De Fistulâ Urethræ et Vesico-vaginali. Hafniæ, 1836; with two plates.
Zeis, Handbuch der plastichen Chirurgie. Berlin, 1818.
Jaeger; in Handwörterbuche der Chirurgie, vol. iii. p. 125.
Michon, L., Des Opérations que nécessitent les Fistules vaginales. Paris, 1841.
Le Roy d'Etiolles; in Gazette des Hôpitaux, 1842, September.
[Barton, J. R., On the cure of Recto-vaginal Fistula by a new operation; in American Journal of Med. Sciences, vol. xxvi., 1840.—G. W. N.]

III.—SOLUTION OF CONTINUITY FROM ALTERED POSITION OF PARTS.

A.—OF DISLOCATIONS.

First Chapter.—OF DISLOCATIONS IN GENERAL.

Duverney, G. J., Traité des Maladies des Os. Paris, 1751, vol. ii.
Pott, P., Chirurgical Works, vol. i. p. 373. Edit. 1783.
Kirkland, Thos., M. D., Observations on Mr. Pott's general Remarks on Fractures. London, 1770. 8vo. Also an Appendix to the former concerning the cure of Compound Fractures. London, 1771. 8vo.
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Böttcher, J. F., Abhandlung von den Krankheiten der Knochen. Berlin, 1796, vol. ii.
Boyer, Traité des Maladies Chirurgicales, vol. iv.
Bernstein, Ueber Verrenkungen und Beinbrüche. Jena, 1819. 8vo.
Cooper, Astley, Treatise on Dislocations and on Fractures in the Joints. London, 1822. 4to. [And Dr. Warren's Edition of the same work. Philadelphia, 1844. 8vo.—G. W. N.]
Caspari, K., Anatomisch-chirurgische Darstellung der Verrenkungen, nebst einem Anhange über die complicirten Verrenkungen. Leipzig, 1821. 8vo.
Cunningham, J. M., Synoptical Chart of the various Dislocations to which the human frame is subjected, comprising their diagnostic symptoms and modes of reduction. London, 1827. fol.
Richter, A. L., Theoretisch-praktisches Handbuch der Lehre, von den Brüchen und Verrenkungen der Knocken. Berlin, 1828. 8vo,; with 40 folio plates.
Hager, Die Verrenkungen und die Verkrümmungen. Wien, 1836.

982. A *Dislocation* (*Luxatio*, *Exarthrema*, Lat.; *Verrenkung*, Germ.; *Luxation*, Fr.) is the slipping of a moveable bone from its natural articular connexion; and is distinguished from the separation of bones immoveably connected with each other (*Diastasis*).

983. The dislocation is either *complete* (*Luxatio completa*) when the corresponding joint-surfaces not at all touch, or *incomplete*, (*Luxatio incompleta*, *Subluxatio*), when they are not entirely separated from each other, with which last must be reckoned *Wrenching* or *Distortion*, (*Distortio*, Lat.; *Verstauchung*, *Verdrehung*, Germ.; *Entorse*, Fr.), in which the joint-surfaces are partially separated, but their natural condition is again restored by the strength of the muscles and ligaments (1). Dislocations are further divided into *simple*, (*Luxationes simplices*), when

unaccompanied by peculiar symptoms, and *compound* (*Luxationes complicatæ*), which are attended with wounds, bruises, fractured bones, severe inflammation, suppuration and other dangerous symptoms; into *recent* (*Luxationes recentes*) and *old* (*Luxationes inveteratæ*), into *primary*, (*Luxationes primitivæ*), when the displaced head of the bone remains on the spot whereon it had been first thrown, and *secondary*, (*Luxationes consecutivæ*), when it is dragged up to some other position by the muscles; into *congenital*, (*Luxationes congenitæ*), and *acquired* (*Luxationes acquisitæ*).

(1) Distortion has various degrees, according as the fibrous tissue, the synovial membranes, the vessels and nerves severally, or altogether, are severely stretched or torn through:—1st degree, Slight pain and gradual swelling of the soft parts; 2d degree, Sudden and severe pain, swelling, and effusion of blood; and therewith, in 3d degree, Unnatural motion of the joint in all directions.

984. The *diagnosis* of dislocations depends on the disturbed function of the dislocated limb, and on the appearances produced by the bone when removed out of its socket. The most remarkable signs are, entire or partial loss of motion of the limb, with altered form and position; it may be shortened or lengthened according as the head of the bone is displaced in this or that direction, or it may be distorted, which depends on the contraction of the muscles, that, by the dislocation of the head of the bone, are most commonly torn and extended, hence rotation of the limb occurs on the opposite side to that on which the head of the bone is dislocated; the natural form of the joint is changed, the socket is empty, and the dislocated head forms an unnatural projection; the limb is fixed in its position by the stretched muscles, and can only with the greatest pain be moved, and often not at all. To these symptoms are added severe inflammation, pain, swelling, and effusion of blood in the neighbourhood of the joint. The determination of the dislocation is therefore more or less difficult, according to the superficial or deep situation of the joint, according to the nature of the dislocation and the degree of the accompanying swelling. A more remote effect of dislocation is a kind of crackling which depends on the effusion of plastic lymph into the joint and into the mucous bags, and may easily mislead to the presumption of fracture.

[The limb is not always at once immoveably fixed after dislocation, even when at the hip-joint. I had a case of dislocation into the ischiatic notch several years since, and when I saw the man six or eight hours after the accident, there was so considerable motion of the thigh, which could be bent quite up to the belly, that I doubted the nature of the accident. On the following morning, however, the limb could not be bent upon the belly, and the other symptoms of dislocation being present, I made use of the necessary means and replaced the bone. I have also seen other examples of the same kind.

Sometimes if a patient be not seen for some hours after a dislocation, it is impossible to ascertain the nature of the accident, on account of the great swelling. The surgeon should therefore be especially cautious to make further examination on the subsidence of the swelling, so that the patient may not suffer from his negligence. J. F. S.]

985. The occasional *causes* of dislocation are external violence or violent contraction of muscles. The former either acts directly on the joint or on the end of the bone opposite, in which case the dislocation is effected more easily; and generally the bone is obliquely situated in reference to its socket, at the moment when the external violence acts. Dislocation specially occurs the more readily, as the parts about the joint and the muscles are lax and the motions of the joint not confined (1).

For the latter reason dislocation of the upper arm is more frequent than that of the thigh; and dislocations of the hinge joints and of such as have broad opposing surfaces to their bones, in which the motion is restricted, are mostly incomplete. Old persons are more rarely subject to dislocation, because the heads of the bones are brittle and easily break; young persons also are rarely subject to dislocation, because their *epiphyses* easily break (2); in persons of middle age dislocation is most common (3).

[(1) Dislocations sometimes happen by mere muscular exertion, some accidental disposition of the bone occurring, by which the ordinary antagonism of the muscles is disturbed, and the efforts of one set become too great for the other. It is in this way that dislocation of the lower jaw is produced, most commonly in yawning; the jaw is excessively depressed, the temporal muscle is so twisted over the pulley that it has little power, and then the external *pterygoid muscles* pull the necks of the jaw forward, and throw the condyles on the articular eminences. Lawrence (*a*) mentions a dislocation of the shoulder having occurred from muscular action, the patient "had been sitting up in bed to take a dose of medicine, when stretching out the arm to take hold of the cup, without making any exertion, or taking up any particular weight, the *humerus* became dislocated. Now although the bone came out so easily, yet it did not go back into its proper situation with facility; for it required a pretty strong pull to return it." (p. 477).

Dislocations may also result from the laxity of the ligamentous capsules of joints. Astley Cooper mentions one of a dancing-girl capable of throwing the knee-cap from the articular surfaces flat upon the side of the outer condyle of the thigh-bone, in whom this had been produced by violent exertion when a child. (p. 11). And another case in which a young lad had had, whilst on board ship, his foot placed on a small projection on deck and his arm lashed tightly towards the ship's yard, and so kept for an hour, the result of which was that he had the power of readily throwing his arm out of the shoulder-joint, merely by raising it to his head; but it was reduced by very slight extension. (p. 13.) He also gives another case, on the authority of Brindley, in which a man of fifty years had a dislocation of the thigh which he was capable of producing and reducing at pleasure.

(2) My friend, the younger Travers, has informed me that he had in February 1843, a case of dislocation into the ischiatic notch, in a boy of five years old, who, whilst at play in a paved yard, slipped down and was unable to rise. He could neither walk nor maintain the erect posture. All the symptoms of dislocation were present; the head of the bone was resting upon or next to the margin of the ischiatic opening, not having as yet sunk into the cavity of the notch, which Travers considers, is always a secondary result of this accident. There was some mobility of the limb. The head of the bone, was almost immediately reduced, by confining the *pelvis* with a strap upon a firm deal table, turning the child upon his sound (the left) side and making the usual extension, with slight rotation outwards and raising the knee. This is the earliest instance of accidental dislocation with which I am acquainted.—J. F. S.

(3) Malgaigne has made an interesting inquiry into the frequency of dislocation in the different joints, and from this it appears, that of 491 cases there were of—

Dislocations of					
the shoulder	321	thumb	17	knee	7
hip	34	wrist	13	spoke-bone	4
collar-bone	33	fingers	7	knee-cap	2
elbow	26	jaw	7	spine	1
foot	20				

And also that from the age of two to fifteen years, dislocation of the shoulder occurred only once out of four dislocations, but after sixty years about once out of one and a-half (*b*)].

986. In every complete dislocation, the capsular and other ligaments, as also frequently the tendons and muscles surrounding the joint are

(*a*) Lectures in Lancet, 1829–30, vol. ii. (*b*) Gazette Médicale.

torn; only in great laxity of the ligaments of the joint, and large collections of *synovia*, is dislocation without tearing possible. If the head of the bone be soon returned to its natural position, in general there are not any decided symptoms; but if it remain any length of time out, of the joint, it acts as a foreign body on the surrounding parts, and the socket is gradually filled up. If it be in contact with the cellular tissue, it so compresses and thickens it, that it, as it were, forms a capsule around the head of the bone, whilst the torn ligaments are still attached to the surrounding parts; the muscles lose by pressure, their structure, their power of contraction, and becomes almost fibrous. If the head of the bone lie upon a bone, it forms a hollow in it, around the edge of which bony growths take place, by which the head is more or less perfectly enclosed. In such old dislocations the motions of the joint are always more or less interfered with, the nourishment of the joint suffers, it wastes, and the muscles become lax.

987. The *prognosis* of dislocation depends on its complication, seat, duration and cause. Simple dislocation may usually, by early assistance, be reduced, and in general is not dangerous; compound dislocation is, however, on the contrary, frequently accompanied with very dangerous symptoms, and according to the degree of bruising and tearing of the soft parts, according to the constitution of the patient and the like, it is often as necessary, as in compound fracture of bones, to determine at once on the necessity for amputation, or the possibility of preserving the limb. Dislocations in ball- and socket-joints are commonly less dangerous than in hinge-joints, although they are more difficult to reduce. In joints surrounded with strong muscles and ligaments, severe symptoms mostly occur.

The earlier the reduction of a dislocation is attempted, the more easily is it effected (1); this, however, must often be delayed, on account of the already existing great inflammation and swelling, though not too long, as the dislocated bone is always to be considered as the principal cause of these symptoms (2). In dislocations depending on palsy of the muscles and laxity of the ligaments, the reduction is easy, but its recurrence on the slightest violence is to be feared. In powerful or in old persons the reduction is more difficult than in young and weakly persons. From pressure of the head of the bone upon the nerves and vessels severe symptoms often occur; there may be either partial or complete palsy, or stiffness of the joint, and *anchylosis* may remain as consequence of inflammation.

[(1) My friend, Liston, tells me, that he once reduced, without assistance, a dislocation on the back of the hip-bone, two or three minutes after it had occurred, by the person having been thrown from his horse, simply by putting his hand on the *pelvis* and pulling and rotating the thigh with the other. This is probably an unexampled case, but it proves, that the earlier the reduction is attempted the less power have the muscles to offer resistance.

(2) The necessity for delay in the reduction of dislocation on account of the accompanying inflammation must be extremely rare, unless violent and unwarrantable efforts have been previously made without success. One such instance I have known, in which suppuration of the shoulder-joint ensued and the patient died, without the dislocation being reduced. But as a general rule, dislocations should be always reduced, and with the employment of moderate force there is little if any attendant danger.—J. F. S.]

988. The cure of dislocation requires, *the reduction of the dislocated head of the bone, the fixing it in its socket, and the removal of the symptoms.*

989. The *reduction of the dislocated head of the bone into its socket* (*Repositio*, Lat.; *Einrichtung*, Germ.; *Réduction*, Fr.) is to be attempted by extension and counter-extension, and by pressure on the head of the bone itself, which thrusts it into its socket.

The object of the extension and counter-extension is to counteract and lengthen the contracted muscles; therefore many recommend that the extension and counter-extension should not be made at the extremities of the dislocated bones, so that there should not be any circular compression of the muscles of the limb by which they may be excited to more violent contraction. This notion, however, is rejected by Callisen, A. Cooper, and other surgeons. In certain dislocations, for instance those of the elbow-joint, the extension and counter-extension can only be effected on the dislocated bones themselves. The extension must always be made in the same direction as that in which the head of the bone was displaced, and with gradually increasing force, so as to tire the muscles; the position of the limb must specially be such as renders the muscles as lax as possible (*a*).

Voelcker (*b*) effects the same by pressure of the air according to Weber's experiments. (Compare *par.* 234.)

990. Extension and counter-extension are performed either merely with the hands, or by assistants with twisted cloths, properly applied upon the limb, above and below the dislocation, or with proper machines, among which the pulleys and Schneider's extending apparatus are the best. If the head of the bone become more moveable by gradual extension, and approach the socket, it often slips in of its own accord, and with a distinct noise; or it must be drawn towards the socket with the hands, or with cloths, in doing which the limb is brought into a position contrary to that of the dislocation. It must, however, be here remembered, that the parts of the joint be not injured by too violent motion, when the extension is not sufficiently made. The perfect reduction is indicated by the natural form and direction of the limb, the cessation of pain, and the freedom of motion.

[Dislocations which have existed for some time, although they may not be reduced by ordinary extension for an hour or two, may sometimes be reduced simply by tiring the opposing muscles, by attaching a trifling weight for some hours. The younger Cline in this way succeeded in reducing a dislocation of the shoulder which had been out for several weeks and could not be replaced by the common method, by fixing the shoulder and suspending a brick, attached to the hand, over the end of the bed. On visiting the patient next day, the bone had returned to the socket.

In making extension, caution must be employed, and no more violence used than absolutely necessary, nor ought the surgeon to handle the displaced bone too roughly, as unfortunately is much more frequently done than should be. I have known a dislocated bone broken by coarse and unjustifiable attempts at its reduction, and cases are mentioned in which an artery has been torn through, all the soft parts lacerated, and palsy of the limb produced. And even when the extension has been very long continued, without great violence, but in a broken constitution, I have

(*a*) Loder's Journal, vol. iii. pl. ix. f. i.

(*b*) Worin liegt der Grund der geringen Beweglichkeit und der schweren Einrichtung der luxirten Glieder; in Hamb. Zeits., vol. vi. pt. ii.

seen abscess in the joint and hectic fever destroy the patient. Caution, therefore, in making and continuing the extension is most important.—J. F. S.]

991. The obstacles which render the reduction of the dislocation difficult or impossible are, great inflammation and swelling, too small opening in the capsule, the peculiar form of the joint, and the long existence of the dislocation. In the former case suitable extension cannot be employed without occasioning dangerous symptoms; the inflammation, as in fractured bones, (*par.* 587,) must be first got rid of by general and local antiphlogistic treatment before proceeding to reduction.

A too small opening in the capsular ligament, is mentioned by many as hindering the reduction, and it is advised that by moving the limb in different directions, the cleft in the ligament should be increased (*a*). A. Cooper, however, entirely opposes this proposition, and believes only that some of the untorn ligaments prevent the reduction.

The form of the joint may render the reduction difficult when the edge of the head of the bone is pushed behind the edge of the socket, as, for instance, at the hip- and shoulder-joint.

Old dislocations always require previous blood-letting, baths, movement of the limb in various direction, a considerable and continued extension. Dislocations of ball- and socket-joints often after a month are unreducible; reduction has, however, been effected by great force after four and even six months. In hinge-joints, after twenty or thirty days, the reduction is often no longer possible. It is, however, to be remarked on this point, that in old dislocations, if a very violent extension be employed, except in very emaciated, flabby, and old persons, the consequences of the extension are more severe than the advantage of the reduction. In young muscular persons, three months may be considered as the longest space of time, at which the reduction of a dislocation should be attempted. If the patient be urgent for an attempt at reduction, he must be made aware of the circumstances already mentioned, and the attempt must be made with caution, so that the muscles and nerves be not damaged. In old dislocations, a threefold obstruction may render it impossible:—1, union of the head of the bone with the surrounding parts, so that even after death, when the muscles are cut through, the head of the bone cannot be returned; 2, the socket may be filled up, in which case the head of the bone, even though reduced, cannot remain in its place; 3, if a new socket be formed in the bone upon which the head lies, so that without fracture it cannot be separated from it (A. Cooper.) (*b*).

[The length of time after the accident, at which a bone may be reduced, varies considerably, and depends on the form of the joint and the patient's muscular power. I am inclined to believe, however, they may sometimes be reduced at a longer period than two or three months, and that it is right to make the attempt, but the surgeon should be pressed to the trial rather than press the patient. Of course the more simple the form of the joint, and the more shallow the socket, the easier is the reduction, hence ball and socket-joints are more readily replaced than hinge-joints,

(*a*) Callisen, Systema Chirurg. hodiern. vol. ii. p. 684.

(*b*) Marx, Jusqu'à quelle époque est-il possible d'opérer la réduction des Luxations? Paris, 1829.—Von Froriep, Veraltete Luxationen vom Standpunkte der Chirurgie und med. Polizei betrachtet. Weimar, 1834.—Nevermann, Ueber die Nothwendigkeit, veraltete Luxationen einzurichten; in Hamburger Zeitschrift, vol. ii. pt. iii.

and the shoulder than the hip. Professor Smith, of New Haven, U. S., reduced one dislocation of the shoulder at seven months, and another at ten and a-half months. There is an excellent statistical account (*a*) of the practice of Dupuytren in the Hôtel-Dieu at Paris, in which the twenty-three cases successfully treated by him varied from between fifteen and eighty-two after the accident. Breschet (*b*) mentions a reduction of dislocated hip at seventy-eight days, and three of the shoulder at the eighty-second, ninetieth and ninety-eighth day respectively; and in the Mémoires de l'Académie Royale de Chirurgie de Paris, vol. v. p. 529, is related a dislocation of the hip reduced after two years.—J. F. S.]

992. As the muscles mostly render difficult the reduction of dislocation, in many cases it can only be facilitated or rendered possible by diminishing their contractile power. This is effected by those remedies which have a disposition to produce faintness, or even fainting, as a smart blood-letting, (according to the state of the patient's constitution), a warm bath, nauseating doses of tartarized antimonial wine, tobacco clysters, drunkenness, perhaps also opium (*c*), and by frightening (*d*), or diverting the patient's attention.

993. After complete reduction the head of the bone has usually no particular disposition to slip out again; this occurs only in violent motions of the joint, or when the dislocation depends on great weakness of the ligaments or muscles. The limb should be brought into a position, in which the muscles are relaxed, and such bandages applied will prevent its motions, and it should be kept quiet. Cold applications are employed to prevent or get rid of inflammation. When the inflammatory symptoms have passed by, careful movement of the limb is to be made, for the prevention of stiffness of the joint, by the long-continued rest.

[Sometimes after the reduction has occupied much time, the muscles are so completely tired out and deprived of their tone, especially in persons of lax fibre, that they will not retain the head of the bone in its place, and consequently the mere weight of the limb will reproduce the dislocation. For this reason, not merely are bandages applied immediately after the reduction, but the joint should be carefully examined without disturbing them, for the first two or three days, to ascertain that the parts are in their proper place. I have known an instance in which a dislocated upper arm after having been reduced and carefully bandaged up, was left undisturbed for some weeks, and on the removal of the bandages was found to have slipped out, and could not be reduced again.—J. F. S.]

994. The treatment in sprains is to be the same as for bruises. Cold applications are to be employed, with careful rest of the joint, general and local blood-letting, proportionate to the bruising and inflammation, and subsequently, for the complete dispersion of the extravasated fluids, spirituous and aromatic applications used. There often remains for a long while swelling, weakness of the joint, and, in old persons, a crackling in the joint, which is removed by volatile rubbing, douche bath, and the like.

[The two great auxiliaries in reducing dislocations, are bleeding and nauseating doses of tartar emetic. The bleeding should always be made in a large stream from one or both arms, according to his apparent strength, and whilst the patient stands upright, till he feels faint, which is best determined by his bursting out into a cold, clammy sweat, and unless carefully noticed he drops on the floor before the surgeon is aware. Immediately on the faintness occurring the extension should be made, the bandages and pulleys having been previously adjusted, if thought necessary; and it should be made steadily and not by jerks. Frequently the excitement of the

(*a*) Philadelphia Journal of Medicine.
(*b*) Répertoire Générale.
(*c*) Cooper, A., above cited.
(*d*) Dupuytren; in Ammon's Parallele, p. 170.

pain revives him, and it is then advisable to give him a grain of tartar emetic every ten minutes, so as to keep him in a state of *nausea* till the reduction is effected. If the dislocation be of long standing it is well to reduce the patient's strength by spare diet and purging for two or three days previous to the operation; and on the same morning to give him nauseating doses of tartar emetic for some hours prior to the extension, so as to put him in the most favourable condition. And the French surgeons are in the habit of applying poultices and other relaxing applications to a dislocated joint, for the purpose of rendering the parts more yielding some days before attempts at the reduction are made.—J. F. S.]

995. Dislocations *accompanied with tearing of the soft parts* covering the joint and *thrusting out of the head of the bone*, belong to those rare but most dangerous cases, in which severe inflammations, weakening suppuration, slough and nervous symptoms are to be dreaded. The danger is greater as the bruising and tearing of the parts of the joint are more severe, the older the patient, and the more out of condition his constitution. According to these circumstances the necessity for amputation, or the possibility of preserving the limb, must be determined. Amputation, however, may subsequently become necessary from wasting suppuration, from sloughing, and the like. If the immediate removal of the limb be not indicated, the head of the bone must be returned as soon as possible, and with the least injury of the parts of the joint; the wound must be completely closed with sticking plaster; the limb surrounded with compresses and with SCULTETUS's bandage, kept in proper position by the application of splints, and the patient must be treated strictly antiphlogistically, according to the state of his constitution. The wound often heals by quick union and without any particular symptoms. If suppuration ensue, the cure often takes place with an emollient treatment; but generally, if it be copious, it is accompanied with severe pain and nervous symptoms, and must be treated according to the rules laid down for wounded joints (*par.* 559). If gangrene come on, it requires the proper treatment.

996. If the reduction of the head of the bone, protruded through the soft parts, be in no way possible, even after proper enlargement of the wound in the skin, nothing remains, but to saw off the protruding bone, by which the stretching and tearing of the muscles are relieved, and the joint can be brought to its natural position; after which the symptoms, in general, soon and considerably diminish. When the reduction of a bone protruding through the soft parts is not immediately possible, it is still less so, when inflammation runs into suppuration; the symptoms continue increasing, and amputation may be rendered necessary by gangrene, and by progressive destruction, if the head of the bone have not been removed at the proper time.

997. When dislocation is connected with fracture of a bone, the latter must always be attempted to be set, if it can be done, without extension of the limb. If this be not possible the fracture must be treated first, and on the length of time requisite for that purpose, depends, whether after union has occurred, putting to rights the old dislocation can be undertaken.

998. *Congenital Dislocations*, (*Luxationes congenitæ*,) noticed by HIPPOCRATES, AVICINNA, PARE, PALLETTA, SANDEFORT, and SCHREGER, at the hip-joint, where they most commonly occur, more carefully described by DUPUYTREN, and more recently the subject of numerous observations, have been since noticed in almost all the joints of the ex-

tremities. Very different opinions are held as to the causes and origins of these dislocations, principally however with reference to the congenital dislocation of the thigh. Most persons have considered them as defaults of formation, as the consequence of arrested development of the bones and their sockets (Schreger, Dupuytren, Breschet, and others). Some have considered them as consequent on distension of the capsular ligament, and of misproportion between the bone and its socket thereon depending (E. Stromeyer) (*a*). Others ascribe them to the position of the *fœtus* in the womb, or to violence operating on them during birth (the Author, D'Outrepont, Cruvelhier). Von Ammon (*b*) grounds them on default of development; he does not however deny, that therewith in many cases is connected an original deficient condition, or a diseased formative process; and in like manner may the ailment have a purely diseased origin, in certain, though very rare cases, and have no connexion with the fœtal development of the hip-joint. Guerin (*c*) considers it as the product of an active or primary retraction of the muscles, the remote cause of which is to be sought in the affection of some central part of the nervous system. On the degree and form of the muscular affection, depends the degree of dislocation, as does its development and course upon many secondary circumstances, to wit, prevention of the development of the muscles following on their retraction, physiological contraction and vertical operation of the tendons.

999. The examination of the joint after death, has explained various changes, in the several tissues constituting the apparatus of the joint, as distension, tearing of the capsular, and other ligaments; diminution, flattening, distortion of the head of the bone; diminution of the socket, its filling up with a quantity of fat, flattening or entire disappearance; a more or less deep new cavity for the dislocated head; the muscles surrounding the joint contracted, shortened, and variously altered in their substance; considerable wasting in the affected limb. On examination soon after birth, tearing of the ligaments is found, but otherwise the natural form of the socket and head, and the joint especially, is as in acquired dislocation. (Palletta).

1000. If the result of these examinations be used for the purpose of clearing up the way in which these dislocations originate, it must only be permitted us to draw conclusions from these observations which have been made soon after birth, as in old dislocations of this kind, still more decided changes must arise from the progressive development of the body, as well in the empty socket, as in the dislocated head, than in old dislocations which have occurred at a later period of life. But in the examination of such congenital dislocations at an early period of life, there are only such conditions of the parts of the joint as can be ascribed to the position of the *fœtus* in the womb, or to the violence which has operated during birth. An observation of Cruvelhier's (*d*) favours the first cause as regards congenital dislocation of the thigh-bone, an observation of Palletta's (*e*) the second. This is still more decided as regards congenital dislocations in other joints, as resulting from several

(*a*) Ueber Atonie der fibrösen Gebilde und deren Rückbildung. Würzb. 1840.

(*b*) Die angeborenen chirurgischen Krankheiten des Menschen. Berlin, 1842, p. 113.

(*c*) Gazette Médicale, 1841. No. 7. 10. Recherches sur les Luxations Congénitals. Paris 1841.

(*d*) Exercitationes Pathologicæ, p. 88.

(*e*) Anatomie Pathologique, vol. ii. fasc. i.

observations. The position of the *fœtus* in the womb, I consider, is the principal cause of this dislocation, and I believe, that the dislocation is effected by it, either directly, in a mechanical way, or that it gives rise to the prevention of the development of the parts of the joint, and therefore that the latter is not to be considered as a primary cause, but only as a consequence. The observations of D'Outrepont on the origin of this dislocation, from violence during birth, correspond with mine, and I find no contradiction to my long published opinion, in that which Von Ammon (*a*) has objected to it.

1001. The possibility of reducing congenital dislocation depends on the changes which the muscles have undergone in their dimensions, direction, structure, and texture, on the change in the ligaments and capsules, the head and surfaces of the joints, on the changes of the vessels and nerves, of the cellular tissue and skin, and on the changes of the bones in the neighbourhood of the dislocation. Reduction is to be effected by long continued and gradually increased extension by means of proper apparatus, and by properly fixing the head of the bone, in the socket, after it has been brought into it. If the several shortened muscles do not lengthen, and project considerably, extension should be assisted by cutting them through beneath the skin.

Second Chapter.—OF PARTICULAR DISLOCATIONS.

I.—OF DISLOCATION OF THE LOWER JAW.

(*Luxatio Maxillæ Inferioris*, Lat.; *Verrenkung der unteren Kinnlade*, Germ.; *Luxation de la Mâchoire inférieure*, Fr.)

Binken, Dissert de maxillæ inferioris luxatione. Göttingæ, 1794.
Zertamino, Ueber den wahren Mechanismus der Luxation der unterkinnlade; in von Siebold's Chiron., vol. ii. p. 349.
Boyer, Above cited, vol. iv. p. 77.

1002. The condyles of the lower jaw can be dislocated only in one direction, viz., forwards; the spinous process of the sphenoid bone prevents it inwards, the front wall of the bony auditory passage backwards, the impossibility of inward movement of the opposite side without fracture outwards, and the horizontal surface of the temporal bone upwards. Most commonly both condyles are dislocated together, but frequently only one or other. At the moment when the dislocation occurs, the separation of the two jaws is very great, but gradually it diminishes to an inch or an inch and a-half; the incisive teeth of the lower jaw project more than those of the upper, the lips cannot be closed, the spittle pours out in large quantity, the pronunciation of the tones, especially of the lip tones is prevented; a depression is observed in front of the ear-passage, on the inner side of the cheek a projection caused by the coronoid process; the natural prominence of the *m. masseter* is flattened. If the dislocation be only on one side, the chin is drawn in the opposite direc-

(*a*) Above cited.

tion; on one side only, is the depression before the ear-passage observed, and the lips may be more closed; the speech, however, is faltering. If the dislocation be not reduced, the jaws often remain fixed in the separation already mentioned, but the patient gradually acquires the capability of speaking more distinctly, and of retaining the spittle, and swallowing with less difficulty. Chewing remains impossible, and the patient must be fed with fluid food; but in some cases the capability of chewing hard food has returned. (Boyer).

1003. Dislocation of the jaw takes place in some persons very easily but never in children, on account of the peculiar form and direction of the jaws. Its cause is either external violence, which thrusts the chin downwards and backwards, when, at the same moment the muscles raising the jaw, especially *m. masseter* and *pterygoideus internus* contract; or violent straining in vomiting or yawning, by which the chin is violently drawn down, and by the simultaneous action of *m. pterygoidei externi* projected fowards.

1004. *Reduction* when effected early is easy. The patient should be seated on a low seat and his head pressed by an assistant against his breast. The two thumbs, wrapped in linen, are then to be carried as far back as possible, between the hind teeth, and put upon their crowns, whilst the fingers placed beneath the chin bring it forwards and raise it at the same time. If the dislocation be only on one side, the reduction is to be performed only with one hand, in the way described, but is more difficult than when both condyles are dislocated. For the purpose of acquiring great power in this proceeding, the patient may be seated on the floor (Le Cat). If the reduction cannot be thus affected, a piece of cork may be introduced between the hinder teeth and the lower jaw pressed forward against the upper. If the dislocation be only one-sided, the cork is to be applied only on that side.

[The readiest mode of reducing a dislocated jaw is, to set the patient on the floor and fix the back of his head between your knees. Then the handles of a couple of forks, or two round pieces of hard wood of similar size, are to be thrust in, one at each corner of the mouth, between the hind teeth, as far as they can be got. You then place both hands beneath the chin, and drawing it directly and steadily up, the sides of the jaw forming a pair of levers, the contraction of the temporal muscles, which fix the condyles in their unnatural place, is overcome, and the reduction is easily effected. A little knack is requisite to raise the chin evenly, and keep the fork-handles well fixed, otherwise one condyle only will slip in, and the attempt to reduce the other, will often displace that first returned. With inattention to this circumstance, this will occur again and again to the annoyance of both patient and surgeon.

If only one condyle be dislocated, it is still best to introduce the fork-handles on both sides.—J. F. S.]

1005. After the reduction is effected, the lower jaw should be fixed by the halter bandage or by a cloth folded together passed beneath it and tied on the head. The patient must for some days refrain from talking or chewing, must only take fluid food, and for a long time use it cautiously, and in gaping support the chin with his hand.

1006. The case may be considered as *subluxation of the lower jaw*, when from great laxity of the ligaments, the condyles escape over the edge of the inter-articular cartilages in the sockets of the temporal bones, and fix the jaw with the mouth somewhat open. Generally this

accident is relieved by the natural efforts; it may, however, continue a longer time and yet the capability of moving the jaw and closing the mouth may be recovered. At the moment when this subluxation takes place the patient feels himself incapable of completely closing his mouth; he feels some pain, and the mouth on the affected side is least closed. Great depression of the jaw directly downwards is required to restore the natural position of the joint.

In great laxity of the ligaments, a snapping and some pain is felt in the joint of the jaw, immediately before the ear, when the jaw suddenly returns into its socket, out of which, on account of the looseness of the ligaments, it had escaped forward upon the articular eminences. Young ladies are most subject to this accident; it is best relieved by ammonia and steel, together with shower-bath and blistering, if the disease have existed some time (A. Cooper).

1007. *Congenital dislocation* of the lower jaw was first noticed by Guerin (*a*), in a *fœtus* with deficient formation of the brain. The stretching and shortening of the depressing muscles, and of the *m. pterygoidei externi* are remarkably opposed to the lengthening and thinning of the *m. masseteres*. Smith (*b*) observed a congenital dislocation of the jaw on the left side, in an idiot from birth, and considered it as consequent on arrested development in the transverse root of the cheek-bone or of the articular eminence, so that neither socket nor articular process being present, the zygomatic process of the temporal bone was not formed, but that process of the cheek-bone was lengthened, the condyles of the lower jaw were deficient, atrophy of the articular processes of both upper jaw and cheek-bones, and the forward position of the orbits were changed. The case differed from dislocation by accident, in the mouth opening and shutting without hindrance, the lower jaw being moveable to a great degree, as naturally, the upper jaw overhanging it, the coronoid process forming no prominence, and the speech not interfered with.

II.—OF DISLOCATION OF THE VERTEBRÆ.*

(*Luxatio Vertebrarum*, Lat.; *Verrenkung der Wirbelbeine*, Germ.; *Luxation de la Colonne Vertébrale*, Fr.)

1008. The connexion of the *first vertebra* with the *occipital bone* is so firm, partly from the ligaments, partly from the muscles, partly from the condition of the joint-surfaces, that a dislocation at the junction of the first *vertebra* with the head (*Luxatio capitis, nuchæ*) cannot well be produced, and if it be so by extraordinarily great violence, it is absolutely fatal from the simultaneous injury of the spinal marrow.

1009. The turning and movement of the head is, for the most part, effected by the connexion of the second with the first *vertebra*, by which the latter, with the head, moves round the tooth-like process of the former, as upon a pivot. In forcible bending of the head forwards, the ligament fastening it to the tooth-like process may be torn, so that that

(*a*) Researches sur les Luxations Congénitales. Paris, 1841.

(*b*) Dublin Journal of Medical Science. May, 1842.

* The subjects Fractures and Dislocations of the *Vertebræ* are so closely connected, that it is almost impossible to separate them; and I have therefore already preferred considering them together under the former title (p. 582, and following).—J. F. S.

process drives directly into the spinal canal. This dislocation always requires very considerable violence, and is not very possible in adults, in which case there is previous fracture of the tooth-like process. In rotation of the head, the lateral ligaments of this process are stretched, and if this motion be carried to a dangerous extent, they may be torn, and the process carried beneath the transverse ligament of the first *vertebra* into the spinal canal. In children in whom the tooth-like process is still low, and the ligaments less firm, they may be torn by violence when the head is drawn directly upwards. The violent circumstances which can produce dislocation of the second *vertebra* are, a fall from a great height upon the head, a violent blow, or the fall of a heavy body on the nape, standing and turning about the head, and lifting up children by the head. By the intrusion of the tooth-like process into the spinal canal, pressure and tearing of the spinal marrow are produced, and help is impossible. Cases, however, seem to be known, in which only the lateral ligaments of the tooth-like process have been torn by violence and the patient has lived in this state although the process was still held but by the transverse ligament (*a*).

1010. The connexion of the *last five neck vertebræ* allows the inclination of the neck forwards, to the side, and a rotatory motion, by which, if carried to a violent extent, the joint-surfaces of the oblique processes get free from contact, are pushed against each other, and cannot be returned to their natural position. Hitherto, this dislocation has been only known on one side, as a consequence of external violence or of strong twisting of the muscles. If at the same time there be severe pain at the seat of dislocation, the head turned towards the opposite side, and fixed in this position, the muscles which move the head are not spasmodically contracted, the spinous processes deviate from their natural position, from the seat of dislocation up to the head. Walther (*b*) has observed the simultaneous dislocation of both inferior oblique processes of one of the middle neck *vertebræ*, and from this case has given the symptoms of such dislocations. The head is turned back, and the neck so bent, that the original line forms a curve, of which the convexity is forwards and the concavity backwards, the front parts of the *vertebræ* are more separated, but the spinous processes at the same time are pushed one upon another. Such dislocation may, as Walther's case proves, happen without any dangerous effect on the spinal marrow; but there may occur with it, as well as with every other injury of the vertebral column, effects on the spinal marrow dangerous to life, as pressure, tearing, inflammation, and the like, and death may be immediate or soon consequent.

Dupuytren (*c*) guards against the possibility of confusing such dislocation with rheumatic affection of the neck, which, from some straining or violent motion of the head, often comes on with severe pain, impossibility of motion, and the head

(*a*) Delpech, Précis élémentaire, &c., vol. iii. p. 47.

(*b*) Ueber die Verrenkung der Halswirbel nach eigenen Beobactungen; in his Journal für Chirurgie und Augenheilkunde, vol. iii. pt. ii. p. 197.

Lawrence, W., On Dislocations of the Vertebræ; in Med.-Chir. Trans. vol. xiii. p. 387.

[Norris, Case of Complete Dislocation of the fifth, from the sixth, Cervical Vertebra. Amer. Journ. of Med. Sci. vol. i. N. S. 1841.—G. W. N.]

(*c*) De la Luxation des Vertèbres et des Maladies qui la simulent; in Leçons Orales, vol. i. p. 397.

directed to one side, just as it may occur, under similar circumstances, at any part of the spine (as in the so-called crick in the neck).

1011. If the dislocation of an oblique process be left alone, the pain gradually subsides, and the patient has no other inconvenience than an unnatural position of the neck and restricted motion of the head. It is, therefore, held most advisable by some (Desault, Boyer, Richerand, and Dupuytren) to leave this dislocation alone, because in attempting to reduce it, the spinal marrow may easily be so torn as to cause sudden death (*a*). This opinion is, however, grounded especially upon an imperfect reason, and various cases are known, in which the reduction of this dislocation has been followed with happy results. Seifert (*b*) has refuted the reasons against undertaking the reduction of this dislocation, and has frequently performed it successfully. The patient should be placed on a low seat, or sitting on the ground, and his shoulders firmly held back by an assistant. The surgeon then grasps the head, with one hand beneath the chin and the other beneath the *occiput*, makes extension first in the direction of the dislocation, then in the longitudinal axis of the neck, and when this seems to have been sufficiently made, he twists the head strongly towards the dislocated side. Still the more pressing is the necessity for reduction in dislocation of both oblique processes of the neck *vertebræ*, and that this may be effected, with care, the observation of Walther proves. The patient is to be put in a horizontal position, held up by three assistants, one of whom makes counter-extension on the *pelvis*, a second draws the shoulders back, and when the trunk is thus properly fixed, a third assistant grasps the head and makes extension, first in the direction of the dislocation, afterwards in the natural longitudinal axis of the neck, that is, he first pulls the head pretty forcibly back by gradually lengthening the neck, and then turns it backwards. But when the extension in this direction has attained a certain extent, the head must be brought into its naturally straight position, by undiminished and still successively increasing extension.

Guérin (*c*) reduced a seventh months' dislocation of the second *vertebra* of the neck upon the third.

1012. Dislocation of the oblique processes of the back *vertebræ* cannot happen, nor dislocation *of the bodies of neck-vertebræ*, on account of the breadth of their joint-surfaces, the quantity and thickness of their ligaments, the strength of the muscles surrounding them, and the slight motion with which each *vertebra* is endowed. Only when the bodies of the *vertebræ* are broken can they be dislocated; but then so great violence operates that symptoms of pressure and concussion of the spinal marrow accompany it. All the cases described as dislocation of the back and loin *vertebræ*, are fractures of those bones, or simple concussion, or some other injury of the spinal marrow. In consequence of the form and connexions of the bodies of the *vertebræ*, every dislocation must cause death.

Dupuytren has collected several cases in which dislocation was accompanied with fracture; in one case separation of the bodies of the *vertebræ* occurred from

(*a*) Petit-Radel, Dictionnaire de Chirurgie; in Encylopédie Méthodique.

(*b*) Ueber die prognostische Bedeutung therapeutische Behandlung der Halswirbel verrenkungen; in Rust's Magazin, vol. xxxiv. p. 419.

(*c*) Révue Médicale, August, 1840, p. 276.

tearing of the intervertebral substance, without any fracture. In all these cases death followed the simultaneous injury of the spinal marrow.

From what has been said, it may be collected, how those cases are to be thought of, in which with some projection observable after the operation of violence upon the spine, the patient cannot sit upright, and so on, it has been supposed that by laying the body over a tub or any round body, the common dislocation could be reduced. Boyer has also observed on this point, that in violent bending of the spine, the upper and interspinous ligaments of the spinous processes, and the hinder so-called yellow ligaments may be torn. If the tearing be confined to the interspinous and to the upper ligaments, the patient may recover after a longer or shorter period of rest; but tearing of the yellow ligaments causes palsy and death (*a*).

1013. The ligaments of single *vertebræ* may be partially or completely torn through, without dislocation, but the injury of the spinal marrow therewith connected may cause death suddenly or subsequently; and to such cases all that has been said in relation to fractures of the spine applies. In every case of distortion and tearing of the ligaments of the spine, only a strict antiphlogistic treatment, with continual rest, and subsequently, frequent purgatives to prevent the destructive subsequent diseases, may be employed.

III.—OF DISLOCATION OF THE PELVIC BONES.

(*Luxatio Ossium Pelvis*, Lat.; *Verrenkung der Beckenknochen*, Germ.; *Luxation des Os du Bassin*, Fr.)

Creve, Von den Krankheiten des weiblichen Beckens. Berlin, 1795. 4to. p. 137.

[Harris, On Dislocation of the Sacro-Iliac Symphysis. N. American Med. and Surg. Journal, vol. 4. 1827.—G. W. N.]

1014. The broad surfaces of the articulations of the pelvic bones, and the great strength of their ligaments, render their separation impossible under natural circumstances, except when acted upon by extraordinarily great violence. The rump-bone may be dislocated *inwards*, and the hip-bone, *upwards*. These dislocations are never complete; the effects of violence, however, usually act upon the intestines of the pelvic cavity and upon the spinal marrow, and inflammation and tearing of these intestines and effusion of blood, and so on, in the pelvic cavity, ensue; also, palsy of the lower limbs, of the bladder, and *rectum;* and not unfrequently is fracture of the pelvic bones present.

The treatment of these dangerous injuries must be precisely the same as has been mentioned (*par.* 615) for fractures of the pelvic bones.

One case shows that a dislocation of the hip-bone upwards may be produced by a fall from a great height, without symptoms of concussion of the spinal marrow or injury of the pelvic intestines. The share-bone and the spine of the hip-bone of the left side were higher; the left limb was shorter than the other, but the distance from the *trochanter* to the spine of the hip-bone and to the knee, was the same as on the other side; flexion and extension of the thigh were accompanied with severe pain in the *symphysis pubis* and *sacro-iliaca*, with which frequently the whole hip-bone moved. The extension caused only severe pain, without bringing the limb to its natural length. The treatment in this case consisted in strict quiet, and the employment of proper antiphlogistic remedies. When the patient began to walk, he gradually, by the weight of his body, recovered the proper position of the hip-bone (*b*).

(*a*) Boyer, p. 121. (*b*) Ibid, p. 135.

1015. Great as must be the violence to produce a separation of the hip-bone, if its articular connexions have their natural degree of strength, just as easily can it be produced if these connexions be lax and yielding. Such is the case in loosening and swelling of the ligaments of the pelvis during pregnancy. Wherefore also frequently from the extension which these bones suffer during delivery, or if the woman get about soon after her downlying, a pretty smart pain is suffered in one or both joints of the pelvic bones, which recurs at every movement, and is accompanied at first with the sensation of a tearing, and subsequently, distinct crepitation is felt in the pelvic joints. The gait of the patient is then difficult, and on examination, the position of the two hip-bones is not found alike, the one being more or less high than the other.

A similar swelling, loosening and laxity of the joint ligaments of the pelvic bones often arises from an internal diseased condition, in which slight violence is sufficient to produce a separation of the pelvic bones.

1016. The principal indication in these cases is, to fix the *pelvis* as steadily as possible and prevent every movement; for which purpose, a belly bandage, or a leathern girdle, is to be applied sufficiently tight around the hips; by this the pain is often instantaneously got rid of, and the patient's movements much improved. How far the laxity of the ligaments, depending on general causes, may be relieved by friction, purging, and the like, must depend on the circumstances of the individual case.

1017. The *coccyx* may by violence be driven inwards, or by difficult labour be thrust outwards, giving rise to fixed pain, increased by motion of the lower limbs, but especially in going to stool; frequently it becomes severe and pulsating, when suppuration takes place. The ligaments are not torn in this so-called dislocation of the *coccyx*, it therefore recovers its natural position; the employment of the hand for its replacement, by the introduction of the finger into the *rectum*, or by its application externally is therefore superfluous. The treatment consists merely in rest, antiphlogistic treatment, and the local application of remedies to effect dispersion and get rid of the inflammatory symptoms. If suppuration take place, a speedy outlet must be afforded to the pus, or otherwise considerable destruction of the loose cellular tissue is produced.

IV.—OF DISLOCATION OF THE RIBS AND THEIR CARTILAGES.

(*Luxatio Costarum, earumque Cartilaginum*, Lat.; *Verrenkung der Rippen und ihrer Knorpel*, Germ.; *Luxation des Côtes et de leurs cartilages*, Fr.)

1018. Dislocations of the hinder end of the ribs have been totally denied by many writers, but admitted by others, who have mentioned a threefold kind of separation, *inwards*, *upwards*, and *downwards*, and complete and incomplete dislocation. So long as the examination of corpses had not shown the existence of these dislocations, it was doubtful whether the common dislocation were not fracture of the hinder end of the ribs; examination, however, has proved the possibility of the dislocation of the ribs.

B. Cooper (*a*) mentions a case of Webster's, in which a man who had died of fever, was, on dissection, found to have the head of the seventh rib drawn upon the front of the corresponding dorsal *vertebra* and anchylosed to it. Some years previously he had had a sudden and violent fall from his horse, for which the ordinary treatment of fractured ribs had been had recourse to. Donne (*b*) showed from the examination of the body of a child of eleven years old, a complete dislocation of the tenth, and a partial one of the eleventh rib; Fimicane one of the eleventh and twelfth rib, Hankel (*c*) a dislocation of the eleventh rib.

1019. Dislocation of the ribs is only produced by the direct operation of external violence. It occurs most frequently at the eleventh and twelfth ribs, because their front end has no point of support, the transverse process is less projecting, and the costo-transverse joint, together with the interosseous costo-transverse ligament are deficient. Dislocation of the rib may be distinguished by its greater mobility, when the finger is run along it, and which is still more perceptible the nearer it approaches the hinder end; by a particular rustling, (which is not to be confused with that from fractured rib or from emphysema), which is perceived on the movements of the body and ribs by the practitioner, or by the patient himself; by a yielding of the parts covering the hinder end of the rib; by a depression where the head of the rib should be found, and by motion of the hind end on pressure of the front end. It is accompanied with cough, difficult respiration, severe pain, and other symptoms, as in fractured ribs (*par.* 627).

1020. To effect *reduction*, the patient should be placed with his chest upon a firm pillow, so that the front end of the dislocated rib may be pressed backwards, and then the *vertebra* above and below the dislocation is to be pressed down. The rib must be kept in place, by a thick compress placed at the front end and upon the spinal column, and properly fastened with a chest bandage. If the object cannot be thus attained, it has even been advised to open the cavity of the chest, and with the finger or with a hook to bring the rib into its place. No one should be seduced to such a practice. It is most proper in every case to proceed, as in fracture of the ribs, to prevent the motions of the chest, with a broad bandage, and to counteract the other symptoms by proper means.

1021. The *cartilages* of the upper false and lower true ribs may be separated in violent bending backwards of the body, in which the ligaments are torn where the under cartilage overlaps the upper. At this part projection and depression are observed, the patient feels pain, and the breathing is somewhat disturbed. The natural position of the cartilage can be restored, if the patient inspire deeply and bends backwards, whilst some pressure is made on the projecting cartilage. The treatment is the same as in fracture of this cartilage (*par.* 629).

Astley Cooper (*d*) has noticed dislocation of the cartilage most frequently at the sixth, seventh, and eighth rib, from the breast-bone and the end of the rib, not unfrequently in children, as consequent on general weakness.

(*a*) His Edition of A. Cooper's Dislocations, q. 520.
(*b*) Gazette Médicale de Paris, 1841, No. 26.
(*c*) Ib., 1834, p. 187.
(*d*) Above cited, p. 537.

V.—OF DISLOCATIONS OF THE COLLAR-BONE.

(*Luxatio Claviculæ*, Lat.; *Verrenkung des Schlüsselbeines*, Germ.; *Luxation de la Clavicule*, Fr.)

1022. *Dislocation of the Collar-bone* is much more rare than fracture, and may be of the *sternal end* or the *scapular end* of the bone.

1023. It is generally held that the *sternal end of the collar-bone* may be dislocated *forwards*, *backwards*, and *upwards*. In this dislocation, if the separation of the joint-surfaces be only rather considerable, the tendinous strengthening fibres, the interclavicular ligament, and perhaps frequently the fibres of the sterno-mastoid muscles seem to be torn.

In dislocation *forwards*, which is the most common, and depends on violent pressing backwards or inwards of the shoulders, a projection is observed on the fore and upper part of the breast-bone, which subsides when the shoulder is pressed outwards; the shoulder stands deeper and more inwards; the head is inclined towards the ailing side; the movement of the arm is interfered with and painful; if the shoulder be raised, the prominence subsides; if the shoulder be depressed, the prominence rises up towards the neck. The dislocation is frequently incomplete, the front only of the capsule being torn, and the bone but little projecting. In dislocation *upwards*, the distance between the two sternal ends of the collar-bones is diminished, and the dislocated end is higher than that of the opposite side. Dislocation *backwards*, the possibility of which is admitted by most persons, though by others in a manner doubted, but which has been proved by a case of Pellieux's (*a*), may be caused by violence which thrust the shoulder forwards, or acts immediately upon the sternal end of the collar-bone from before backwards. Its symptoms are a depression in place of a projection, at the inner end of the collar-bone, only at the opposite end there is decided position and direction of the bone from within outwards, and from behind forwards, severe pain in the region of the collar-bone, and upon the whole side of the neck to the very base of the lower jaw, the mastoid process and occipital protuberance, on sudden movement of the arm, especially in certain opposition to overcome it, as well as with pressure of the hand; on motion, a dull rustling is perceptible to the patient, as of rubbing the two surfaces of the bone together; some pain on rotating the head, hence a degree of stiff neck, so that the head, neck, and chest move together if the patient look sideways; incapability of the patient raising himself from the bed, except by putting an object before him to serve as a point of resistance; lastly, slight pain in swallowing.

As the greater number of writers on this dislocation state that, in it, the wind-pipe and gullet, the vessels and nerves are compressed, and severe symptoms are thereby produced, neither of which was observed by Pellieux in his case, and the assumption of which depends only on a short notice of Duverney's (*b*), and a case related by Astley Cooper, in which dislocation in the second way occurred, therefore Pellieux gives a superficial and a deep dislocation of the sternal end of the collar-bone, taking for the former, the symptoms above described, but for the latter, which can scarcely occur but from direct severe violence upon the collar-bone, and with complete tearing away of the *m. sterno-mastoideus*, the more important symptoms of

(*a*) Mémoire sur la Luxation de l'extrémité sternale de la Clavicule en arrière; in Révue Médicale, 1834, August, p. 161.

(*b*) Traité des Maladies des Os, vol. i. p. 201.

pressure on the wind-pipe and gullet, and on the vessels and nerves of the neck. But this statement is unsupported by any reason: for in the case related by A. Cooper, (p. 401), there occurred, during great curvature of the spine, a *gradual* dislocation of the sternal end of the clavicle backwards, in which for the purpose of relieving the severe symptoms of impeded swallowing, the dislocated end of the collar-bone was removed.

[In September, 1835, there was admitted into St. Thomas's Hospital, under Tyrrell, a case of compound dislocation of the collar-bone, backwards which I saw. It had been caused by an earth-slip of twelve feet in height, burying him, whilst employed in preparing for the Southampton rail-road, and driving the sharp end of a pickaxe, with which he was working, into his chest. He reached the hospital three hours after the accident; and on examination, the cellular tissue below the right collar-bone and on the upper part of the breast-bone was found emphysematous. The collar-bone was distinctly dislocated backwards at its sternal end, and there was a wound in the skin opposite the junction of the second rib with its cartilage. When the finger was introduced into this aperture, the great pectoral muscle was found completely scraped from its clavicular attachment, and the finger could pass as far outwards as the coracoid process of the blade bone, and inwards, it followed the collar-bone to the windpipe, on the right and fore-part of which it rested, slightly sunk behind the upper piece of the breast-bone, so that it somewhat interfered with respiration and deglutition. The interarticular cartilage seemed to remain in its proper place, except a small portion which had been torn off with the bone; the extreme inner end of the collar-bone could not, however, be distinctly felt; no wound of the intercostal muscles could be ascertained. The pickaxe had probably first passed upwards and outwards, then turned inwards, torn off the pectoral muscle from its origin, and having dislocated the bone, passed inwards above the breast-bone in those directions in which the finger could move; probably it had wounded the *pleura* and right lung, which appeared the only way of accounting for the emphysema. According to his own account, it would seem as if the handle of the tool had penetrated, for he says, the handle was standing upright and he fell forward upon it. But I doubt the correctness of this, as the skin wound was not more than two inches long, and beneath it my little finger would just enter, and no room to spare. He complains of a little pain opposite the middle of the second piece of the breast-bone; but he has not any other pain in his chest, and no fracture can be discovered. He seems to breathe easily, although he complains of difficulty of breathing, accompanied with great desire to cough, and a sensation of pressure on the windpipe, which is much increased on raising the skin of the neck when he throws his head back.

The shoulder having been brought back with straps attached to a back-board, the board readily resumed its place. The elbow was brought forward and bound to the side. The wound was dressed with sticking plaster, and he was put to bed with the shoulders much raised. He went on without the least unfavourable symptom; in three weeks left his bed, and three weeks after went out of the house. The sternal end of the collar-bone still fell a little backwards, and was a little more moveable than natural. He was warned not to use his arm violently.

In September, 1839, Velpeau (*a*) had under his care a case of simple dislocation of the sternal end of the collar-bone inwards and backwards. The man had been violently squeezed between the wall and a cart, "in such a manner as to thrust the left shoulder forcibly inwards, and break up the ligaments which connected the clavicle of the same side to the first bone of the *sternum*; in this way the sternal end of the left clavicle lay upon the superior edge of the *sternum*, behind the sternal attachment of the sterno-mastoid muscle. The articulating surface of the bone lay close to the junction of the *sternum* with the clavicle of the opposite side. Velpeau considered that in the first instance the force producing the dislocation had operated, so as to displace the sternal extremity of the clavicle upwards and backwards, inasmuch as the bone lay behind the sternal portion of the sterno-mastoid muscle, and that it was after this had been effected, that the displacement inwards and across the upper part of the *sternum* occurred. He considered this was the first instance of this kind of displacement of the sternal extremity of the clavicle which had been observed; in which opinion, however, he was wrong, as the case just mentioned proves.—J. F. S.]

1024. The *reduction* of the dislocated sternal end of the collar-bone

(*a*) Lancet, 1839-40, vol. i. p. 422.

is easy; with one hand the elbow is fixed, and with the other placed on the upper part of the humerus, the shoulder is drawn outwards and backwards, as in treating fracture of the collar-bone (*par.* 639.) In dislocation forwards, the shoulder should be pressed forwards, in that backwards, backwards, and in the upward dislocation upwards, so as to prevent the slipping out again of the end of the bone; and the arm is to be kept in proper position with the apparatus already mentioned for fractured collar-bone. According as this apparatus is more or less relaxed, there commonly remains greater or less deformity at the sternal end of the bone, which, however, has no effect upon the motions of the arm.

Melier's apparatus, in dislocation of the collar-bone forwards, in which a compress similar to a truss, and pressing on the projecting end of the bone, is connected with Desault's apparatus (*a*).

[It will not be out of place to mention here, the operation performed by Davie, of Bungay, on the case of backwardly dislocated sternal end of the collar-bone referred to by Astley Cooper, in which the bone pressed so upon the *œsophagus* as to occasion extreme difficulty in swallowing. "An incision was made of from two to three inches in extent on the sternal extremity of the clavicle, in a line with the axis of that bone; and its surrounding ligamentous connexions, as far as he could reach them, were divided with the saw of Scultetus (often called Hey's); he then sawed through the end of the bone, one inch from its articular surface from the *sternum*, and fearful of doing unnecessary injury with the saw, he introduced a piece of well-beaten sole-leather under the bone whilst he divided it. When the sawing was completed he tried to detach the bone, but it still remained connected by its interclavicular ligament, and he was obliged to tear through that ligament by using the handle of the knife as an elevator, and after some time succeeded in removing the portion of bone which he had separated." The case did well (*b*).]

1025. The scapular end of the collar-bone can only be dislocated *upwards*, (extremely seldom *downwards* beneath the *acromion*), and the separation of the two articular surfaces is not great. The cause is generally a severe fall upon the shoulder, by which it is violently turned backwards. The signs of this dislocation are pain on the top of the shoulder, depression of the shoulder, a great space between the *acromion* and scapular end of the collar-bone, or a projection of the latter; unaccustomed motion of these two parts, impeded motion of the arm, especially in elevation, diminished distance of the shoulder from the chest, disappearance of the prominence when the shoulders are drawn backwards, but which reappears when it is let go; and if the finger be carried forward upon the spine of the blade-bone it is stopped by the projecting end of the collar-bone.

It has been hitherto assumed that the acromial end of the collar-bone can only be dislocated upwards; at least, experience knew no other kind. Tournel (*c*), however, saw a case in which the weight of a horse, in a sudden fall, caused separation and driving back of the blade-bone, the collar-bone still remaining fixed at its sternal end, but its outer end, from which the inferior and coraco-clavicular ligaments were torn, was separated from both articular surfaces, and slipped beneath the *acromion*. The pivot motions of the arm could be made in the usual directions; the left arm was somewhat longer than the right, the elbow and upper part of the arm lay against the side of the trunk; the voluntary motions, especially those upwards, were impossible, the patient could not bring his hand to his head; the communicated motions were free and painless; the shoulder had lost its rounded form,

(*a*) Archives, générales de Médecine, Jan. 1829, p. 53.—Froriep's chirurgische Kupfertafeln, pl. ccxxvii.

(*b*) A. Cooper, above cited, p. 402.

(*c*) Archives générales de Médecine, 1837. December.

and below the *acromion* externally was a deep hollow. The shoulder had also two prominences, an internal and upper, formed by the *acromion*, and an external under by the lower end of the collar-bone. Neither numbness of the fingers nor pain were present; the point of the left shoulder was much nearer the breast-bone than the right; when the finger was carried along the spine of the blade-bone from behind forwards to the *acromion* it was stopped by the projection of the collar-bone. This was perfectly discernible, and disappeared, as well also as the hollow beneath the *acromion*, when the shoulders were drawn back, the knee being placed between them; but so soon as this was left off, the projection formed by the end of the collar-bones and the depression beneath the *acromion* reappeared. With DESAULT's apparatus, and subsequently with that of FLAMMANT, a cure was effected without deformity, and without restriction of the motions of the arm. MELLE (*a*) examined after death, and described such a dislocation of the outer end of the collar-bone downwards.

1026. This dislocation is always easily reduced; the arm is to be raised up against the collar-bone, the scapular end of which is to be depressed. DESAULT's apparatus for fractured collar-bone is applicable, with the alteration of putting a thick compress upon the scapular end of the collar-bone, and the turns of the bandage which are carried over the injured shoulder and the elbow, to be sufficiently tightened, and further, the arm to be also fixed to the breast with a bandage. The first days the injured parts are to be moistened with cold dispersing applications. As often as the bandage becomes loose it must be tightened. In from four to six weeks it may be removed; most commonly there remains greater or less displacement, which, however, does not interfere with the motions of the shoulder.

[The dislocation of the collar-bone upon the spine of the blade-bone is one of the most tiresome accidents we have to do with; at least in all the cases I have had to deal with, and the injury is not unfrequent, I have never been able by any contrivance to keep it in place, and have therefore given up attempting to keep it reduced, and only endeavour to keep it at rest, so that it may form new connexions on the scapular spine.—J. F. S.]

VI.—OF DISLOCATION OF THE UPPER-ARM.

(*Luxatio Humeri*, Lat.; *Verrenkung des Oberarmes*, Germ.; *Laxation du Bras*, Fr.)

BONN, Abhandlung von Verrenkungen des Oberarmes. Leipzig, 1783.
DESAULT, above cited.
WARNECKE, Abhandlung über die Verrenkung des Oberarmes aussdem Schultergelenke und deren Heilart. Nurenberg, 1810; with plates.
BOYER, above cited, p. 174.
MOTHE, Mélanges de Chirurgie et de Médecine. Paris, 1812.
BUSCH, Dissert. de Luxatione Humeri. Berlin. 1817.
DUPUYTREN, De la différence dans le Diagnostic des Luxations et des Fractures de l'extrémité supérieure de l'Humerus; in Répertoire Général d'Anatomie et de Physiologie Pathologique, vol. vi. part iii. p. 165.
MALGAIGNE, Luxations de l'Articulation Scapulo-humérale; in Journal des Progrés des Sciences et des Institutions Médicales, vol. iii. Paris, 1830.
COOPER, ASTLEY, above cited, p. 415.
CRAMPTON, PHILIP, M.D., On the Pathology of Dislocation of the Shoulder-Joint; in Dublin Journal of Medical and Chemical Science, vol. iii. p. 42. 1833.

1027. The free motions of the shoulder, the great misproportion between the size of the head of the upper-arm-bone and the flattened

(*a*) Nova Acta physico-medica, 1773, vol. v. p. 1.

hollow of the joint-surface of the blade-bone, the slight strength of the capsule of the joint, and the frequent operation of external violence upon the shoulder-joint, render the *dislocation of the upper-arm* more frequent than that of any other bone.

1028. The head of the upper-arm-bone may be displaced in three different directions:

1, *Upwards* (and *inwards*); the head of the bone rests on the front edge of the blade-bone, between the insides of the long heads of the *m. triceps* and the *m. subscapularis.*

2, *Inwards;* the head of the bone recedes between the subscapular pit and the muscle of the same name, beneath the *m. pectoralis major.*

3, *Outwards;* between the infra-spinate pit and muscle. [This is the dislocation *backwards* of English surgeons.—J. F. S.]

The dislocation downwards is the most common, that inwards more rare, and that outwards the rarest. The dislocation upwards is impossible, partly on account of the acromial process, and the firmness of the joints especially, partly because the upper-arm cannot, on account of the trunk, be driven inwards as much as necessary in order to dislocate it upwards.

Astley Cooper (*a*) speaks of a fourth partial dislocation, when the front of the capsular ligament is torn, frequently only stretched, and the head rests against and on the outer side of the coracoid process of the blade-bone (*b*).

1029. If the head of the upper-arm-bone be dislocated *downwards*, it may be drawn inwards by the contraction of the muscles, (but the *m. triceps extensor* prevents it being pulled outwards,) and thence gradually upwards towards the collar-bone. In the dislocation *outwards* such consecutive displacement towards the spine of the blade-bone is not possible. In dislocation of the upper-arm-bone, there may be therefore a fourfold varying position of the head of the bone: 1, *downwards;* 2, *outwards*, always primitive; 3, *inwards*, frequently primitive, usually consecutive, and, 4, *inwards* and *upwards*, constantly as consecutive dislocation. A. Cooper, however, does not think that the head is dislocated consecutively, when the muscles have once contracted and no great violence operates.

Less change of position may originate in the absorption arising from pressure.

Opinions vary in reference to the primitive direction of dislocation of the upper-arm. Many (Hippocrates, Duverney, Fabricius ab Aquapendente, Desault, Mursinna, Richerand, Mothe, and others) admit only the dislocation *downwards* as primitive, and that inwards and outwards as secondary. Others (Velpeau, Malgaigne) determine only two primitive dislocations, namely forwards and inwards, and backwards and outwards.

1030. The several kinds of dislocation of the upper-arm are characterized by the following symptoms:

In dislocation *downwards*, the arm is rather longer, can be moved only a little outwards, and motion in any other direction causes severe pain; in old persons, however, the laxity of the muscles often permits more extensive motion; the elbow stands out from the trunk; the patient inclines himself towards the side of the dislocation, holds the arm half-

(*a*) Above cited, p. 446.
(*b*) Dupuytren, Leçons Orales, vol. iii. p. 105.—Hargrave, W.; in Edinburgh Medical and Surgical Journal, October, 1837.

bent, and supports his elbow on his hip. Beneath the *acromion*, which seems more prominent, a hollow is observed, the joint has lost its roundness, the middle line of the arm is directed towards the arm-pit in which is felt a globular protuberance, formed by the displaced head of the bone, only, however, when the arm is separated from the trunk. A kind of crackling is frequently noticed on motion, depending on the exuded matter, or on the effusion of *synovia*, which disappears on continuance of motion, and is never so great as in fracture. The pressure of the head of the bone upon the axillary *plexus* often causes loss of sensation, and the sensation of being asleep in the fingers.

In dislocation *inwards*, the elbow stands out from the trunk, and is inclined a little backwards; the direction of the arm corresponds to the middle of the collar-bone, the movement of the arm backwards is not very painful, but forwards extremely so. Beneath the great pectoral muscle is felt the protuberance of the head; the arm has either its natural length or is rather shorter; the flattening of the shoulder is observed especially at its hinder part; the fore-arm is not half-bent.

In dislocation *outwards*, the arm is inclined inwards and forwards, the flattening of the shoulder is most distinct in front; the head of the bone forms a prominence in the infra-spinate pit; the arm may be moved forwards with the least pain, but every other movement is in the highest degree painful.

In imperfect dislocation, where the head is inclined forwards against the coracoid process, a hollow is observed opposite the back of the shoulder-joint and the hinder half of the glenoid cavity is perceptible; the axis of the arm is inwards and forwards; the under motions of the limb may be completely performed, but the arm cannot be raised, because the upper-arm is thrust against the coracoid process of the blade-bone; the head forms a distinct protuberance, and if the arm be rotated, the rolling motion of the head is felt.

It is very difficult, and generally impossible, in dislocation of the upper-arm, to determine whether the dislocation of the head of the bone inwards, be primary or consecutive; but inquiry as to how the symptoms have followed each other, and even the treatment in setting, may perhaps afford some clue.

1031. Dislocations of the upper-arm are produced by violence, which strikes the arm, and happens only on that particular direction of the arm, at the moment when the violence acts, according to which side the head of the bone is driven against the capsule and dislocated. In the occurrence of dislocation downwards, the contraction of the *m. pectoralis major*, *latissimus dorsi* and *teres major* especially participate. It, however, particularly depends on the *m. deltoides*, as shown by examples when this dislocation has happened in raising a heavy load.

The destruction of the soft parts in dislocation of the upper-arm, is for the most part restricted to the tearing of the capsular ligament to a tolerable extent and the bruising of the neighbouring parts. In dislocation inwards, however, a tearing of the *m. subscapularis* has been observed; as also oftentimes palsy of the arm, œdematous swelling of it: or a palsy of the deltoid muscle is connected with, or subsequently ensues on dislocation. Fracture of the neck of the upper-arm-bone has also been noticed simultaneously with this dislocation.

1032. The inflammatory symptoms which occur in dislocation of the upper-arm, are usually of little consequence, if reduction be soon effected; but if the dislocation be left alone, considerable interference

with the movements of the arm occurs; the dislocated head is kept fixed in its position, the motions of the arm depend only upon the mobility of the blade-bone, and often after from four to eight weeks, reduction is no longer possible, even with the greatest efforts.

1033. In *reducing* dislocation of the upper-arm, the shoulder must be well fixed, the arm extended to a proper degree, and its head brought back in the same way in which it was dislocated. The patient should sit on a common seat, (in difficult cases it is advantageous to lay him horizontally on a couch,) a folded cloth is to be applied above the wrist, its two ends tied and given to an assistant. An oblong, tolerably thick bolster should be put into the arm-pit, projecting beyond the edges of the great muscles of the breast and back, and over it a folded cloth, the ends of which are to be carried over the front and back of the chest, to the sound shoulder, there tied, and given to an assistant. For the more complete fixing of the shoulder-blade, a second cloth is applied with its middle on the *acromion*, its ends carried obliquely forwards and backwards, towards the other side of the chest, and given to an assistant, who draws them properly in this direction towards him. Or the shoulder is fixed by a proper bandage, *(retractor)*, through the opening of which the arm is passed (*a*). The surgeon stands on the outside of the limb, and directs the assistants as to the direction and commencement of the extension.

In the dislocation downwards, extension must be made directly outwards, and when carried to a proper extent, the arm must be pulled downwards, and somewhat forwards till it be applied to the side of the body, when the surgeon rests his body against the elbow, and with both his hands applied, the one on the upper, and the other on the under surface of the upper arm, carries the head back into the socket.

In dislocation inwards the extension must be made outwards and backwards, the arm brought forwards and downwards, till it lie obliquely across the front of the breast, and the surgeon then assists the return of the head of the bone, by placing one hand upon the elbow and the other on the inside of the arm, and pressing the head outwards.

The dislocation outwards requires extension in the opposite direction to the preceding (*a*).

In reduction the following points are to be especially noticed. As every dislocation of the upper arm occurs only in a certain position, so must its extension also be made in a corresponding position, and according to the directions laid down. In this position the *m. deltoides*, *supra-spinatus* and *infra-spinatus*, which mostly oppose the reduction, are rendered lax. On this account the dislocation is often reduced with ease, immediately after its occurrence, by raising the arm to the horizontal posture, and placing the fingers in the arm-pit. The arm is not to be brought into its natural position, till the head of the bone has been restored to the place from which it has slipped. The head is usually carried back into the socket, rather by the action of the muscles, than by any force applied to it. By what has been said is explained the fitness of La Mothe's (*b*) proposed mode of reduction. The patient is to be placed on a seat; the shoulder to be fixed by means of a cloth, folded lengthways, applied over it, and held by two assistants sitting on the ground; a third standing

(*a*) Proper retractors are described by Pitschel (Anatom. und chirurg. Anmerkungen. Dresden, 1784, p. 66); by Mennel (Loder's Journal, vol. iii. p. 300); by Eckoldt (Köhler's Anleitung zum Verbande. Leipz, 1796, p. 299. Pl. viii. fig. 8, 9); by Schneider (Loder's Journal, vol. ii. p. 466) and by Astley Cooper.

(*b*) Busch, above cited.

on the uninjured side, draws horizontally a cloth laid round the chest. The surgeon, standing on a table near the patient, grips the dislocated arm with both hands, raises it, gently drawing it up towards the patient's head, then pulls more forcibly, and thus almost without pain causes the head of the bone to rise up into its place. Rust (*a*) simplifies this treatment; the patient being seated on the ground, on a carpet or flat cushion, an assistant, kneeling on the side opposite the dislocated arm, grasps the injured shoulder with both hands locked in each other, the one of his arms being carried before, and the other behind the patient. Whilst he draws the shoulder strongly and steadily downwards, the surgeon standing on the same side as the dislocated arm, grasps it with both hands at the wrist and fore-arm, draws it somewhat towards him, in order to keep it constantly extended, and raises it by a circular movement, above the head of the patient, so that the upraised arm is brought parallel with the long axis of the body. The surgeon then draws the arm strongly towards him, as if he would raise the patient from the ground, and at the moment this is effected, the head of the bone slips back into its socket. If this do not happen, the surgeon may now give the extension of the arm to an assistant, and kneeling by the patient, places both thumbs under the protruded head, and leads it, by pressing upwards, into its socket. He then fixes one thumb firmly in the arm-pit, with the other hand grasps the elevated arm above the elbow-joint, and draws it carefully down, when, if the head of the bone be not completely carried into its socket, its complete reduction must be attempted, by more firmly sliding it over the opposed thumbs, as if over a roller.

1034. Complete reduction is characterized by the natural form of the joint, the cessation of pain and the free movement of the arm in every direction. To counteract the disposition which the upper-arm always has to become dislocated afresh, its motions should be prevented; the arm is to be put in a sling, or fastened with some circular turns of a bandage round the body, and some may be carried beneath the elbow and over the shoulder. For the first few days cold applications are to be applied over the shoulder to remove the bruising. If a paralytic state of the arm continue, (which there is always ground to fear if after the dislocation there ensue a sensation of cold, of going to sleep, and weight,) stimulating friction, douche-baths, blisters, moxas, and the like must be employed. This may arise from palsy of the deltoid muscle.

1035. In this way the dislocation of the upper-arm-bone may ordinarily again be put to rights. If violent contraction of the muscles occur, we must attempt to diminish it by the remedies heretefore mentioned. A small opening in the capsular ligament is mentioned by many, as the obstacle to reduction in several cases, which may be imagined if the head of the bone return to its place without noise and be directly again dislocated; in such case the aperture of the capsular ligament must be attempted to be enlarged by moving the arm; numerous observations, however, oppose this notion.

1036. Besides the modes of reducing dislocations of the upper-arm already given, the following still require to be mentioned:—

1. In recent dislocation the patient may be laid on his back upon a table or sofa, in such way that the affected arm may be completely on the edge; a wetted roller is to be applied on the arm above the elbow, and over this a handkerchief is to be fastened. The surgeon, standing with one foot on the ground, places the heel of the other in the patient's arm-pit, so that he finds himself in a half-sitting posture by the side of the patient. By means of the handkerchief he extends the arm for three or four minutes, in which way, under ordinary circumstances, the head is easily reduced. If more power be required, a towel instead of

(*a*) Rust, in his Magazin, für die gesammte Heilkunde vol. x. p. 184.—Leonhardt, F., Dissert. de Methodo Mothiano humerum luxationi reponendi. Berlin, 1820. 8vo.

a handkerchief should be fastened around the arm, by which several persons may pull, whilst the heel is still in the arm-pit. In order to relax the *m. biceps* the fore-arm must be bent. In this mode of reduction there is less extension of the limb than lateral separation of the head of the arm-bone from the blade-bone. On this account probably has Bertrandi (*a*) proposed, that the surgeon should place himself between the legs of the patient as he lies in bed, and make use of his left foot if the dislocation be on the right, and his right foot if it be on the left side. Sauter's (*b*) treatment corresponds to this; the patient being placed on a seat, the dislocated arm is to be drawn down perpendicularly on the body, fixed in this direction by the one hand of the surgeon, at the elbow-joint, and drawn towards the ground, whilst with the other hand the head of the bone is thrust upwards; at the same time an assistant may further the extension, by drawing down the hand, but which is not always, nor ever with violence, to be done. In dislocation inwards the arm is to be inclined more forwards.

2. The patient, being seated on a low stool, the surgeon separates the dislocated arm so far from the body, that he can put his knee into the arm-pit, and whilst he places his foot by the side of the stool, he puts one hand upon the arm-bone, immediately above the condyles, and the other upon the *acromion*, then presses the arm downwards over the knee, and in this way reduces the dislocation (*c*).

1037. If in very powerful persons, or in old dislocations, these modes of treatment be unsuccessful, and it be necessary to overcome the muscles by *continued* and *gradually increased extension*, the pulleys are to be employed as most convenient. The patient is to be put on a stool, the shoulder fixed with a retractor, and this attached to a hook fixed in the wall on the patient's sound side; the extension-bandage is to be put on above the elbow, and by other bandages connected with the pulley, fastened to the other wall. The direction of the extension is to be similar to that made by assistants; and it must be made gradually, if intended to be kept up for some time. When it has attained sufficient degree, the surgeon puts his knee in the arm-pit, places his foot on the stool, and raising the head of the bone, thrusts it gently into the socket, which, at the moment when the extension is left off, usually happens without any snap.

The various contrivances proposed for reducing dislocation of the upper-arm are in part superfluous, in part unsuitable, because the mechanical violence acts too much on the head of the bone itself; or the extension cannot be made after every one's favourite direction. To these contrivances belong the ambe of Hippocrates, the machines of Oribasius, Paré, Gersdorff, Scultetus, Purmann, Petit; the reductors of Ravaton, Hagen, Freck, Mennel, Schneider, Brunninghausen, and others.

1038. If the dislocation have existed some weeks, the arm must, previous to extension, be moved forcibly in every direction, for the purpose of loosening it, and the relaxation of the muscles must be effected by the means already mentioned. After the reduction of these old dislocations, an emphysematous swelling is often observed beneath the great pectoral muscle, which soon disappears under the use of dispersing

(*a*) Institutiones Chirurgicæ, vol. v.
(*b*) Ueber die Einrichtung des verrenkten Achselgelenkes; in Hufeland's Journal, vol xliii. pt. i. July, 1816, p. 39.
(*c*) Astley Cooper, p. 432.

remedies. Weinhold cut through the tendon of the *m. pectoralis major*, because it did not yield in an old dislocation (*a*). The dislocations at the shoulder-joint may often be satisfactorily reduced, even after a long time, especially in relaxed persons; the attempt at reduction, however, is not to be carried too far, as dangerous symptoms may ensue (*b*).

Gibson noticed a rupture of the axillary artery in reducing an old dislocation in two cases (*c*).

Dieffenbach (*d*), whilst making extension and counter-extension in the usual manner, in a dislocation of two years' standing, divided the tendons of the *m. pectoralis major* and *latissimus dorsi*, the *m. teres major* and *minor*, beneath the skin, and the false ligaments surrounding the new joint, upon which, with the extension made, the head suddenly returned into its socket, and he then applied over it a pasteboard apparatus.

1039. The *Congenital* Dislocation *of the Upper-Arm-bone* (*Luxatio congenita Humeri*) does not, according to R. W. Smith (*e*), who first noticed it, happen so very rarely. In the early period of life, before the more perfect development of the bones, and before the more powerful action of the muscles, the external appearance of deformity may possibly escape observation; but when the shoulder-bones have attained to their perfect development, when the bony processes about the joints project, and especially when the muscles operating on the shoulder-joint and upper-arm acquire their full activity, then first are the characteristic marks of congenital dislocation not easy to be mistaken. Smith has noticed two kinds of congenital dislocation, viz., the *subcoracoid* and the *subacromial* dislocation.

1040. In the *congenital subcoracoid* dislocation, the head of the upper-arm-bone, when the arm hangs down on the side, is situated beneath the coracoid process, and the outer part of the glenoid cavity can be felt beneath the projecting *acromion;* if the elbow be drawn forward over the chest, the head of the upper-arm-bone slips backwards over the *acromion*, and completely leaves the unnatural part of the articular surface, which can now be distinctly felt; the shoulder has not its natural rounded form, but is flattened. The muscles of the shoulder and arm are much shrunk, and also the muscles passing from the chest to the blade-bone and upper-arm, only the *m. trapezius* shows the least of this, and seems to be almost the only muscle, which still acts upon and moves the blade-bone; the diseased arm is nearly half an inch shorter. The motions of the arm are very much restricted; elevation and abduction are not possible, and even the forward and backward motions cannot be performed without corresponding movement of the blade-bone. Although the muscles of the fore-arm are not so much shrunk as those of the upper, yet flexion is so difficult, on account of the atrophy of the *m. biceps*, that it can scarcely be brought to a right angle. Elevation is not performed

(*a*) Zwanzig de Luxatione Ossis Humeri, et precipuè Incisione Aponeuroseos Musculi Pectoralis Majoris ad cur. Luxat. inveter. Halæ, 1819.

(*b*) Flaubert, Mémoire sur plusieurs cas de Luxation, dans lesquels les efforts ont été suivi d'accidens graves; in Répert. gén. d'Anatomie et de Physiologie Pathologique, vol. iii. fasc. i.

(*c*) [Philadelphia Journal of the Med. and Phys. Sciences, vol. 7, 1823, p. 81, and the 3d No. of the New Series of the same, 1828, p. 136.—G. W. N.]

(*d*) Vereinszeitung, 1839, No 51.

(*e*) An Essay upon the original or congenital Luxations of the upper extremity of the Humerus; in Dublin Journal, vol. xv. p. 236.

Froriep's N. Notizen, July, 1839. No. 225 and 227.

gradually, but with a sudden jerk, in which the blade-bone also is considerably raised, the arm pressed to the side, and sometimes even the body bent to the other side, whilst the elbow-joint rests upon the crest of the hip-bone. The deformity exists from birth, but only first at the period of perfect development does it become more apparent. This congenital dislocation may exist on both sides at once.

1041. Examination after death of a case of subcoracoid dislocation on both sides, showed upon the one side scarcely a trace of the natural socket, but, on the contrary, immediately beneath the lower edge of the coracoid process, partially upon the ribs, partially on the axillary edge of the blade-bone, a well-formed socket of an inch and a-half diameter; this reached to the under surface of this process, and was only separated from the upper-arm by the capsule of the joint. The perfectly formed capsular ligament, extending from the undeveloped glenoid cavity, surrounded these articular surfaces. The perfectly natural tendon of the *m. biceps* arose from the point of the latter, and the capsular ligament was also quite natural. The head of the upper-arm-bone varied considerably from its rounded form; it was oval, and its long axis corresponded with that of the bone itself, which depended especially on the hinder part being deficient. The shaft was small and decidedly atrophic; the position of the head on the coracoid process varied, according to the rotation of the arm inwards or outwards. Upon the other side the deficiency of the articular surface was confined to its inner edge, which was entirely wanting for a thumb's space from above downwards. The inner edge of the joint-surface was formed by a long ridge, which passed down from the under surface of the coracoid process; the tendon of the *m. biceps* and the capsule were perfectly formed.

1042. Smith saw and examined after death *congenital subacromial* dislocation on both sides. The coracoid process projected considerably, as did also the *acromion;* the joint-surface beneath was not, however, to be felt; the projection of the *acromion*, as well as the flattening of the shoulder, was less decided than in subcoracoid dislocation; the flattening was confined to the front of the joint. The head of the upper-arm-bone formed a distinct swelling on the back of the blade-bone, beneath and behind the point of the *acromion*, close on the under surface of its spine. The upper-arm did not stick out from the side, and the fore-arm was rotated inwards. Internal examination of the joint presented no trace of an articular cavity in the usual place, but a well-formed articular pit, surrounded by a capsular ligament, arising from the outer surface of the neck of the blade-bone, which was broader above, and completely reached the under surface of the *acromion;* the tendon of the *m. biceps* was perfect, and firmly attached to the upper and inner part of the unnatural joint's surface, the direction of which was forwards and outwards. The head of the upper-arm-bone exhibited the same oval form as in the subcoracoid dislocation, only that the fore part of the head was in this case deficient. The little tubercle formed a considerable projection, long and curved, so that it had remarkable resemblance to the coracoid process of the blade-bone.

1043. That these dislocations are *congenital* and *not of accidental occurrence*, Smith thinks he has found proof, as regards subcoracoid

dislocation, in the absence of previous injury, in the joint not being the seat of pain, swelling, and the like, but especially in the unhurt condition of the capsule and of the tendon of the *m. biceps*, as well as in the simultaneous existence of a *pes equinus* in the same patient; in the form of the head of the upper-arm-bone being peculiar, and quite different from any change which he has noticed as consequent on disease or in old dislocation of the usual kind. Smith is not disinclined to find a resemblance between this congenital dislocation and that described by many writers, as *partial dislocation* of the upper-arm-bone, as well as that arising sometimes from rheumatic affection of the shoulder-joint, (A. Cooper,) or as an unusual atrophy of the upper-arm, (Curling.) He also supposes that in subacromial dislocation, the absence of the natural joint-surface, the complete resemblance of both unnatural articular cavities, the uninjured state of the tendons and ligaments, as well as the peculiar form of the head of the upper-arm-bone, speaks in favour of the congenital existence of this dislocation. With the few examinations which have been as yet made of this subject, it is not, however, possible to determine with certainty whether the cause of the dislocation should always be sought for in an original deficient formation of the joint surfaces, or whether such dislocations be not produced by the peculiar position of the child, and during birth, and the particular changes subsequently found, on examination, do not depend on the long continuance of the dislocation, and the previously incomplete development of the bones, and so on.

In support of this opinion at least speaks an observation of Guillard (*a*), who reduced a congenital dislocation of the upper-arm-bone by horizontal extension after sixteen years. The reduction was effected after several futile attempts, and when effected it relapsed twice, and was again reduced. After the last reduction, however, the upper-arm for two years and a-half was not displaced, and the movements of the limb were almost entirely natural.

VII.—OF DISLOCATIONS OF THE FORE-ARM.

1044. These dislocations are distinguished into *dislocations of the fore-arm from the upper-arm*, and the *separate dislocations of the* spoke-bone and cubit.

A.—OF THE DISLOCATION OF THE FORE-ARM AT THE ELBOW-JOINT

(*Luxatio Antibrachii*, Lat.; *Verrenkung des Vorderarmes*, Germ.; *Luxation de l'Avant-bras*, Fr.)

1045. Complete dislocations of the elbow occur but rarely, on account of the great strength of the joint, and are always accompanied with considerable tearing of the soft parts. The dislocation may be either *backwards* or *lateral*, but dislocation *forwards* is impossible without simultaneous fracture of the *olechranon*.

1046. The dislocation *backwards* is the most common, and always the most complete. The chronoid process of the cubit gets behind the

(*a*) Révue Médicale, Aug. 1840.

pully-like joint-surface of the upper-arm-bone, and rests in the pit formed for receiving the *olechranon*. The joint-surfaces of the upper-arm-bone are thrown upon the front of the spoke-bone and cubit, between the coronoid process and the insertion of the *m. biceps*. If the lateral ligaments are torn, the muscles surrounding the joint, the skin, and even the brachial artery may be torn. The *olechranon* forms a considerable projection on the back of the upper-arm, whereby the lower part of the *m. triceps* is twisted, and above the projection of the *olechranon* the upper-arm seems to be somewhat hollowed. On the front of the joint is felt a large hard swelling, beneath the tendon of the *m. biceps;* the fore-arm is fixed in a half-bent position, except when there is considerable tearing of the ligaments.

1047. If the *cubit alone*, be thrown *backwards*, without simultaneous dislocations of the *spoke-bone*, behind the upper-arm-bone, the deformity of the joint is considerable, the fore-arm and hand being twisted inwards, the *olechranon* projecting, whilst the head of the spoke-bone retains its natural position; on the outside of the elbow-joint a remarkable projection, and on the inner a pit; the fore-arm cannot be straightened except by violence, which will reduce the dislocation, neither can it be bent farther than to a right angle (A. Cooper); the arm has been, however, observed motionless in extension, and every attempt at bending was painful and unsuccessful; pronation and supination could, however, be freely performed, the latter somewhat less than the former. If the fore-arm be but little bent, the annular ligament of the spoke-bone remains uninjured; but on greater bending, this ligament, the upper part of the interosseous ligament, and several muscular fibres are torn, and the head of the spoke-bone rests against the upper-arm. The distinguishing marks are, projection of the *olechranon*, and the twisting of the fore-arm inwards (*a*).

1048. The *lateral* dislocation may be either *complete* or *incomplete;* that *outwards* is more frequent than that *inwards*. In the former, the internal joint-surface of the upper arm-bone projects more or less, and the joint-surface of the cubit is thrust outwards; the point of the *olechranon* rests on the back of the upper-arm, in consequence of which the fore-arm is fixed in a slightly bent position. In the latter, a part of the sigmoid cavity projects, more or less on the inner, and the joint-surface of the upper-arm-bone on the outer side; the fore-arm is permanently bent. These dislocations cannot happen without tearing of the ligaments of the elbow-joint; even the muscles of the fore-arm may be torn at their origin; hence also frequently, the fore-arm is not so fixed in its position, as in dislocation backwards. In complete lateral dislocation, the projection of the ends of the fore and upper-arm are much more decided than in the incomplete, and on account of the great tearing of the soft parts the fore-arm is moveable in every direction.

As in dislocations of the fore-arm, the joint-surfaces are mostly still in contact so there may be crackling on moving the joint.

1049. Dislocation *backwards* of the fore-arm, is mostly produced by a fall upon the outstretched hand, whilst the fore-arm is bent and the

(*a*) Cooper, Astley, above cited, p. 472.—Révue Médicale, 1830.—Sedillot; in Gazette Médicale, 1839, No. 24.—Froriep's N. Notizen, July, 1839, No. 228.—Michaelis in von Graefe and Walther's Journal, vol. xxix, p. 296.

upper fixed. If the fore-arm be violently forced to one or other side, lateral dislocation may be produced.

1050. Dislocations of the elbow-joint always produce severe inflammatory symptoms, and may lead to gangrene and nervous symptoms; generally, however, they are not dangerous. If left alone, they in a short time become irreducible; the dislocation backwards has, however, been reduced after existing two or three months. If in dislocation backwards, the joint-surfaces of the upper-arm-bone project through the skin, the case is always very serious, though experience proves that a cure may take place without any particular symptoms. If with this dislocation, there be tearing of the *m. biceps*, of the brachial artery or of the median nerve, the case is exceedingly dangerous. The complete lateral dislocations are more severe than those backwards. The incomplete dislocations are neither great nor difficult to reduce; even if they be mistaken the consequences are less important, if only early motion be used.

(1) Astley and Bransby Cooper (*a*) effected reduction after three months. Malgaigne and Lisfranc reduced a dislocation of the elbow backwards, of fourteen weeks standing in a boy ten years old.

1051. The *reduction* of dislocations of the elbow is not difficult, if undertaken sufficiently early. Extension and counter-extension are performed by two assistants, one of whom grasps the fore-arm above the wrist with one hand, and its upper inner part with the other; the second assistant places one hand on the shoulder, and with the other draws back the lower part of the upper-arm. The surgeon, in the dislocation backwards, grasps the elbow with both hands in such way, that the four fingers of the one are upon the front, and the thumb upon the back of the upper-arm, with which, when the extension is sufficiently made, he can press the *olechranon* downwards and forwards. Astley Cooper puts the patient on a stool, places his knee on the inside of the elbow, grasps the wrist and bends the arm; at the same time he thrusts his knee against the spoke-bone and cubit, to free them from the upper-arm-bone, and whilst he keeps up the pressure with his knee, he strongly but slowly bends the arm. The arm may also be violently bent around a bed-post. After complete reduction, the elbow-joint is to be surrounded with moistened compresses, a ∞ bandage applied and the arm to be put in a sling. The supervening inflammatory symptoms must be removed by a proper antiphlogistic treatment, and the continual employment of cold applications. The bandages should be removed every two days, so that gentle movements of pronation and supination may be made, in order to ascertain the actuality of the reduction. The dislocation of the cubit alone, is always easily reduced by one of the prescribed methods; but if, as in the cases mentioned by Sedilnot, the fore-arm be extended, extension must be made, and then the arm bent.

If the coronary ligament of the spoke-bone be not torn, that bone retains its proper position on the cubit; but if it be torn, the spoke-bone must be pressed especially into its place, and the recurrence of its displacement prevented by a splint placed along its back. If in dislocation backward, the lower ends of the upper-arm-bone be driven through the skin, the reduction is not thereby rendered difficult; it must be

(*a*) Above cited, p. 441.

performed as soon as possible, and the wound closed. If severe inflammation exist, sawing off the projecting ends may alone be sufficient to lessen the symptoms. In tearing of the brachial artery and median nerve, the former must be tied before the reduction; however, the probable danger of gangrene in this case may render amputation necessary.

1052. The *reduction* of the lateral dislocation must be effected in the way mentioned, only the joint-ends of the bones must be pressed, with both hands, in the opposite direction to that in which they are dislocated. In these dislocations also Astley Cooper makes extension upon the knee, as already stated. Violent extension of the arm is also often sufficient. The inflammatory symptoms in lateral dislocation are always more severe than in that behind; therefore also is a more strict antiphlogistic treatment required.

1053. Though dislocations of the elbow-joint have great disposition to become irreducible, yet if severe inflammation have come on, reduction must not be undertaken till that has been removed. Before attempting the reduction of an old dislocation, repeated motions of the fore-arm are to be made for several days previously. If repeated attempts do not succeed, violent extension must be abstained from, because otherwise severe inflammation is to be feared.

In dislocation of the elbow-joint forwards, which can only occur with fracture of the *olechranon*, the same treatment must be adopted as in that fracture, with simultaneous antiphlogistic remedies.

1054. The dislocation *backwards of the spoke-bone* is the most common, but occurs more rarely in adults, than in young persons, in whom it does not take place at once; but by the habit of pulling the child by the hand a considerable relaxation of the articular connexions of the spoke-bone is produced, which is often manifested by great projection of its end, and painful swelling of its joint, and if the violence be persisted in, dislocation of the radius backwards is produced. At the moment when the dislocation occurs the patient feels severe pain, the arm is bent, and the hand prone; supination is impossible and increases the pain; the hand and fingers are moderately bent; the upper end of the bone forms a distinct projection.

1055. The dislocation *forwards of the upper end of the spoke-bone*, is the consequence of violent supination. The fore-arm is slightly bent, but cannot be brought to a right angle with the upper arm; if the fore-arm be suddenly bent, the head of the bone strikes against the front of the upper-arm-bone, by which the flexion is suddenly stopped. The hand is prone, but can be brought again perfectly into pronation and supination, although pronation is nearly complete. The head of the spoke-bone can be felt, especially in rotation, which together with the continued flexion of the fore-arm are the most decided characters.

Boyer doubts the possibility of dislocation forwards without fracture at the same time; in which case the supination necessary to produce this dislocation is prevented by the lesser head of the upper-arm-bone, which thrusts violently against the head of the spoke-bone. This opinion, however, is contradicted by foreign and by my own experience. A. Cooper (*a*) has seen the dislocation of the spoke-bone forwards six times; I have seen it twice, and once as an old dislocation in a corpse. The spoke-bone separates from the cubit, at its connexion with the coronoid process, and its head is drawn back into the hollow above the outer condyle of the upper-arm-bone, and upon the coronoid process of the cubit. Examination shows the head of

(*a*) Above cited, p. 474.

the spoke-bone drawn up into the cavity above the outer condyle of the upper-arm-bone, the cubit in its natural place; the coronary ligament of the spoke-bone, the *chorda transversalis*, the front of the capsular ligament and the interosseus membrane are partially torn, and in consequence of the tearing of the latter the separation of both bones is produced.

Rouyer (*a*), Villaume (*b*), and Gerdy (*c*) have also seen dislocation of the upper end of the spoke-bone forwards; B. Cooper (*d*) noticed it once with fracture of the inner condyle of the upper arm, and once with a fracture of the spoke-bone an inch and a-half from its head.

Simultaneous dislocation of the spoke-bone forwards and of the cubit backwards, have been noticed by Bulley (*e*) and by Vignolo (*f*).

A longitudinal dislocation of the spoke-bone, in which the head was displaced laterally and above, over the outer condyle of the upper-arm-bone, was seen by Adams (*g*).

1056. The *reduction* of this dislocation of the spoke-bone is easy. The fore-arm is extended with one hand whilst with the other, the head of the spoke-bone is pressed into its place, and the fore-arm brought into supination, in the dislocation backwards, and into pronation, in that forwards, and should be kept in place after the joint has been surrounded with compresses and circular bandages, by a splint placed on its front or back part. In from twenty to twenty-five days, this apparatus may be entirely removed and careful motion of the arm permitted.

According to Astley Cooper, the reduction of the dislocation forwards of the spoke-bone, requires much force, and he enumerates cases, in which it was impossible; from experiments on the dead body, however, the extension of the hand, in which the spoke-bone alone was acted on, was the most preferable; in this way I have also easily effected the reduction.

If the appearances mentioned (*par.* 1054) indicate the relaxation of the articular connexions of the spoke-bone, all dragging and movement of the hand must be avoided, the fore-arm must be fixed in a half-bent position, and the relaxation of the ligaments removed by suitable applications and rubbings in.

VIII.—OF DISLOCATIONS OF THE WRIST.

(*Luxatio Carpi*, Lat.; *Verrenkung des Handgelenkes*, Germ.; *Luxation du Poignet*, Fr.)

1057. Three kinds of dislocation may take place at the wrist-joint:—1, the dislocation of *both bones of the fore-arm;* 2, the dislocation of the *spoke-bone;* and, 3, the dislocation of the *cubit.*

1058. Dislocation of the *hand* from its connexion with both bones of the fore-arm, may be *forwards*, *backwards*, or to *one* or *other side;* the latter two kinds can only be *incomplete*, the former two more or less perfect. In the dislocation forwards, the hand is bent much backwards, and there is a great projection upon the inside of the wrist; the fingers are bent as well as the fore-arm. In the dislocation backwards, the very contrary symptoms occur; fracture of the spoke-bone mostly accompanies it (A. Cooper.) In dislocation on one or other side, there is always distortion of the hand, adduction or abduction, and a projection on the radial or ulnar side.

(*a*) Journal Général de Médecine, April, 1818.
(*b*) Froriep's Notizen, March, 1828, No. 429.
(*c*) Archives Générales de Médecine, March, 1834.
(*d*) Above cited, p. 457.
(*e*) Prov. Med. and Surg. Journal, 1841.
(*f*) Révue Medicale, 1841.
(*g*) Dublin Journal of Medical Science, 1840, vol. xvii. p. 504.

Dislocation of the wrist-joint, mentioned from the earliest time, has been doubted by Dupuytren, as he denied its existence, and almost its possibility, and proved the presumed cases of such dislocations were fractures of the lower end of the spoke-bone. This opinion is almost generally received, and by a strict criticism of the previous observations of such dislocations supported, against the opinions of Petit, Desault, Boyer and others. But few observations have excited doubts against the statements of Dupuytren. Voillemier has however shown the existence of such dislocations, by the most careful examination of a complete displacement of the wrist backwards and of the bones of the fore-arm forwards, and has given, as distinguishing marks between this dislocation and fracture of the lower end of the spoke-bone, that in the latter there is a bending in on the outside of the fore-arm near the joint, which is wanting in the former; the hand is abducted, but in dislocation, the whole hand is twisted towards the outside of the fore-arm; there is swelling at the fore and under part of the fore-arm, which is wanting in dislocation; but little decided projection of the ends of the fracture forwards and backwards, whilst in dislocation a projection of seven or eight lines backwards is formed by the wrist-joint, and forwards by the bones of the fore-arm; great breadth of the bones on the carpo-metacarpal surfaces, but in the dislocation only the natural breadth; the spoke-bone is shorter, but in dislocation of equal length as in the sound arm; the styloid process of the spoke-bone has its natural place at the wrist, but in dislocation it is situated on the inside of the wrist, to the inner side of the scaphoid bone; the styloid process of the cubit projects upon the back of the fore-arm, but in dislocation on the front; it projects as far or farther down than that of the spoke-bone, whilst in dislocation the styloid processes retain their reciprocal position; the position of the hand, usually though not always, is bent backwards, in dislocation commonly bent.

Compare *par.* 653, where is given the literature of fracture of the lower end of the spoke-bone; Voillemier, in Archives Générales de Médecine, 1842, March; Prinz, G., Ueber den Brüch am unteren Ende des Radius. Erlangen, 1842.

1059. The cause of this dislocation is always, a very violent bending of the hand in this or that direction; hence the ligaments are always much torn, and the tendons on the side of the dislocation very severely torn and stretched. Rarely are other of the soft parts besides the ligaments ruptured.

1060. The *reduction* of dislocation of the hand is not difficult. Extension of the hand and pressure upon the carpal bones in the contrary direction to which they are dislocated, is sufficient. After reduction, the wrist is to be wrapped up in moistened linen, and fastened with a circular roller. If there be a disposition to re-dislocation, which in the dislocation forwards and backwards is generally the case, a splint must be placed on the palmar and dorsal surfaces of the hand, and confined with a circular bandage. Severe inflammatory symptoms always arise, which require suitable treatment and cold applications. Subsequently, aromatic applications, spirituous rubbings, and so on must be used to disperse the often long-continued swelling of the wrist-joint.

1061. In dislocation of the *spoke-bone alone*, which is rare, it is displaced on the front of the *carpus*, resting upon the navicular and great multangular bones. The outside of the hand is twisted backwards, and the inside, forwards; the end of the spoke-bone forms a projection on the front of the *carpus*, and its styloid process is no longer opposite the great multangular bone. The cause of this dislocation is a fall on the hand whilst turned backwards. The treatment is the same as that for both bones.

1062. In dislocation of the *cubit*, which is more rare, and in which the sacciform membrane is torn, the bone usually projects backwards,

forming a protuberance on the back of the wrist, and although it can be easily pressed into its natural place, the deformity recurs when the pressure is withdrawn. The diagnostic sign is the projection of the cubit over the cuneiform bone and the dislocation of the styloid process from the line of the metacarpal bone of the little finger. Pressure restores the bones to their place, in which they are to be retained by splints on both surfaces of the arm and compress on the end of the cubit.

IX.—OF DISLOCATION OF SINGLE BONES OF THE HAND.

1063. The *great bone* (1) alone, can be displaced from its connexion with the scaphoid and semilunar bones, backwards, in consequence of violent bending of the hand; by which a circumscribed swelling is produced on the situation of the great bone, in the direction of the middle finger, which disappears on pressure, but recurs when the pressure is withdrawn. The *reduction* is easily effected by pressure, upon the projecting head of the bone, or if this be insufficient, by simultaneous pulling at the fore and middle finger. The hand is to be kept extended, until it be laid upon a flat board, pressure made upon the projection with a compress, a splint applied, and the whole fixed with a roller. If it remain, in a slight degree, it is not accompanied with any inconvenience.

(1) Not the trapezial bone as stated by B. Cooper and others.

Gras (*a*) has described a dislocation of the *pisiform* bone.

The *great* and *unciform* bones are often thrust somewhat out of their place, in consequence of the relaxation of their ligaments, so that in bending the hand they form a projection on the back of the wrist, and the hand cannot be at all used without supporting the wrist. Strips of sticking plaster and a bandage are usually sufficient for supporting the wrist, and the parts may at the same time be strengthened with the douche bath, and rubbing in volatile ointments and the like.

1064. The *metacarpal bone of the thumb* is alone subject to dislocation from its connexion with the trapezial bone, in consequence of violent bending. The projection which the displaced end of the bone forms above, is very slight, the thumb is bent towards the palmar surface, and cannot be straightened. In reducing it, the extension and counter-extension are made at the thumb and *carpus*, and the displaced joint-end is to be pressed into its place. To retain it there, the thumb should be enveloped in compresses and a circular bandage, and a thin splint fastened on its hinder surface. If the dislocation be mistaken, which easily happens when swelling exists, the movements of the thumb are permanently prevented.

1065. The *phalanges of the fingers* may be dislocated forwards and backwards, by violent bending in either direction. In the dislocation *forwards*, the dislocated bone is bent backwards, the other fingers are bent, the projection of the dislocated joint-surface is on the palmar side; in dislocation *backwards* the contrary happens. In dislocation of the thumb *upwards* from its metacarpal bone, the thumb stands almost at a right angle on the metacarpal bone, with the nail-joint bent; and the

(*a*) Gazette Médicale, vol. iii. 1835.

head of the metacarpal bone forms a large projection on the volar surface. If these dislocations have existed only a short time, they cannot be reduced.

The *reduction* requires great force, as the edges of the joint-surfaces resist each other, and must be separated. This can only be effected, by means of a clove hitch applied round the phalanx. If in compound dislocation the joint-surfaces project out of the soft parts, and their reduction be not possible, they must be cut off, and their replacement effected; this in one case of compound dislocation of the thumb I performed with the best success.

Dislocations of the thumb from the metacarpal bone, most frequently occur, and cause greatest difficulty in their reduction. According to Roser (*a*), who has collected the various opinions upon this dislocation, together with his own observations, the dislocation is always direct, and on the same side on which the violence has occurred. If a person, fall on the ground with his thumbs outstretched, a dislocation takes place on the back, and not in the front of the hand; the thumb is fixed in hyper-extension or dorsal flexion, and forms, often almost a right angle with its metacarpal bone, which makes a considerable projection in the hollow of the hand, and has frequently been mistaken for the dislocated projection of the head of the phalanx, as stated by Fincke (*b*). I possess an old dislocation upwards of the thumb, in which the position of the two bones corresponds entirely with this statement. The difficulty of reducing this dislocation is often so great, that laying bare the old bone, and cutting off the interfering tendons and ligaments has been recommended, (Desault, Dupuytren,) and even the removal of the projecting end of the bone itself, (Evans, Vidal, Norris). In general the jutting against each other of the edges of the joint-surfaces is considered as preventing the reduction; A. Cooper held the interposition of the sessamoid bones to be the cause; Lisfranc and Dupuytren place it in the remarkable position of the tendon of the *m. flexor longus*, which is displaced backwards and downwards, so that it lies midway between the phalanx and the head of the metacarpal bone. Hey thinks the cause to be in the lateral ligaments, between which the head of the metacarpal bone, on account of its wedge-like shape, slips out more easily than it can be got back again. Vidal and Malgaigne conclude from their observations on the dead body, that the hindrance depends on the locking-in of the metacarpal head between the short muscles of the thumb. Pailloux, Lawrie, Blechy, and Roser, by their experiments, found the interposition theory confirmed, and the latter could produce the interposition, as often as he pleased, if only the front of the capsule were torn or cut across, and at the same time a little lengthways. In consequence of these various opinions, different proposals have been made to effect the reduction. According to Hey, the bones may be brought into place by pressure without extension; according to Charles Bell, bending the joint with proper pressure. Fincke applies his two forefingers on the back of the metacarpal bone, presses with it against the thumb, whilst his two thumbs are firmly placed against the under surface of the metacarpal bone, and thus easily effect its replacement. Charles Bell's proposal of subcutaneous division of the lateral ligaments with a contaract-needle has been practised by Liston and Reinhardt (*c*). Roser, from his experiments on the dead body, determines that the reduction can only be effected, when the bone is put into the position out of which it was thrown, and also if the dislocated phalanx be first put in hyper-extension, (dorsal flexion,) and from this be moderately depressed upon the metacarpal head.

From all this it appears that the joint must be neither straightened nor bent too much, the direction of the thumb must always be such, that its long axis be directed perpendicular to the rounded surface or the metacarpal head. If this direction be given to the bone, the titling in and interposition, and with them the obstacle, disappear. I have, in six cases of dislocation of the thumb from the metacarpal bone, been only once unable to effect the replacement perfectly, in which the dislocation

(*a*) Die Verrenkungen des Daumens von seinem Mittelhandknochen; in Archiv. für physiologische Heilkunde, 1843, pt. 2.

(*b*) Casper's Wochenschrift, 1838. No. 18.

(*c*) Preuss. Vereins Zeitung, 1836. No. 23.

had already existed some days. My practice in this reduction is, to apply a wetted bandage around the thumb, the ends of which are rolled round my own hand, and whilst with this I pull *directly* upwards, the left hand is placed on the *metacarpus* and pressed down, whereupon I bring the thumb into the straight position. I must however confess, that all these cases I had considered as dislocations of the thumb downwards.

X.—OF DISLOCATION OF THE THIGH-BONE.

(*Luxatio Femoris*, Lat.; *Verrenkung des Oberschenkels*, Germ.; *Luxation de la Cuisse*, Fr.)

Boyer, above cited, vol. iv. p. 278.
A. Cooper, above cited, p. 37.
Travers, B., in Med. Chir. Trans., vol. xx. p. 112.

[Warren, A letter to the Hon. J. Parker, containing remarks on the Dislocations of the Hip-Joint. 8vo. 1826.—G. W. N.]

1066. Dislocations of the thigh may occur in four directions:—1, *backwards and upwards upon the back of the hip-bone;* 2, *inwards and downwards into the oval hole;* 3, *backwards and downwards into the ischiatic notch;* 4, *upwards and forwards on the horizontal branch of the share-bone.* The former of these is most frequent, the fourth more rare than the second, and the third the most rare, and even denied by many writers. The capsule, as well as the round ligament, is torn in every one of these dislocations, though in that inwards and downwards it may remain entire.

Astley Cooper (*a*) gives other proportions in reference to frequency of the several dislocations of the thigh-bone; he says that the dislocation backwards and upwards is the most frequent, next that into the ischiatic notch, then that on the oval hole, whilst the dislocation on the share-bone is most rare. Besides these four kinds of dislocation of the thigh-bone, some assume a fifth, viz., *directly downwards*, just as others consider the above four kinds only secondary, in which the head of the bone, if there be no fracture of the socket, always leaves the socket at its *lower* edge, and is first situated between this part and the tuberosity of the haunch-bone, though only for a short time.

[Although repeated dislocation of the thigh-bone in the same person is not very common, yet a few years ago there was a woman in St. Thomas's Hospital, under Tyrrell's care, whose hip was dislocated the ninth time. Unfortunately I do not recollect the kind of dislocation.—J. F. S.]

1067. In the dislocation *upward and backwards*, the head of the thigh-bone gets upon the outer surface of the hip-bone, and rests between the external iliac pit and the *m. gluteus minimus;* hence the foot is an inch and a-half, or two inches and a-half shorter, the toes are turned towards the *tarsus* of the other foot; the knee and foot turned inwards; the limb cannot be separated from the other, but the adduction which exists can be increased, that is, it can be bent obliquely over the other. If there be not any considerable effusion of blood or swelling, the head of the thigh-bone may, by rotation of the knee, be felt distinctly upon the outer surface of the hip-bone; the *trochanter* projects less and is nearer the spine of the hip-bone; the rounded form of the hip is lost. Such extension of the limb as can be made with the hand does not restore its natural length. If the dislocation be old, the limb retains its position inwards, and the patient can tread only upon the toes; notwithstanding the great

(*a*) Above cited, p. 39.

shortening of the limb, the patient will gradually be able again to walk. Under these circumstances the somewhat flattened head of the thigh-bone lies on the outside of the hip-bone, in a corresponding hollow, surrounded by a newly formed bony mass. The least and middle gluteal muscles are extended, and converted into a cellular fibrous mass; the thigh diminishes in size. This dislocation is produced by a fall, or some other violence, which drives the thigh inwards and forwards. It happens the more easily, the farther the violence acting on the thigh-bone is distant from the hip-joint, and if at the same time the gluteal muscles be contracted.

1068. In the dislocation *inwards and downwards*, the head of the thigh-bone gets into the oval hole. Although the condition of the socket seems most favourable for this kind of dislocation, it, however, happens very rarely, because it can be only produced by a fall, when the thighs are far apart. The affected limb is two or three inches longer; the head of the thigh-bone is felt, by pressing with the hand upon the upper inner part of the thigh towards the *perinæum;* the *trochanter* is less prominent; the body is bent *forwards*, on account of the extension of the *m. psoas* and *iliacus*, but when the body is erect the limb projects; the knee is wide apart from the other, and cannot be brought near it without great pain; the foot is also separated from the other, but cannot be twisted either inwards or outwards. The thigh seems as if united, with the *pelvis* and has no mobility. If the dislocation be left alone, the limb remains immoveable, in the position described; it has, however, been noticed (*a*) that the external obturator muscle is destroyed, and that the ligament of the oval hole is converted into a mass of bone, which surrounds the head of the thigh-bone as a socket in which it can move.

Ollivier (*b*) describes a dislocation of the thigh-bone *directly downwards*, of which he gives the following symptoms:—the thigh slightly bent at the hip-joint, was a little rotated inwards, and separated from that of the other side; the bent thigh as well as the foot was rotated forcibly outwards; a line drawn from the iliac spine downwards falls upon the inner condyle of the thigh-bone; *no sensible lengthening;* the *m. sartorius* and *tensor vaginæ femoris* projected slightly; the outer part of the *m. triceps* was much stretched; the flank showed a deep fold; the great *trochanter* was directed downwards and backwards; the buttock rounded and prominent; the head of the bone was not in the least felt; the extension of the thigh was impossible; the leg might be straightened; adduction, although painful and little, was easy; abduction could be increased.

1069. Dislocation *backwards and downwards* into the ischiatic notch, happens very rarely, because it can only occur, when the thigh is so near the trunk and the other thigh, that it is scarcely possible. Boyer considers this as secondary, after dislocation of the head of the thigh-bone upwards and backwards, when the thigh is much bent and adducted. In this dislocation, the head of the bone lies on the *m. pyriformis*, between the edge of the bone which forms the upper part of the ischiatic notch, and the sacro-ischiatic ligaments, somewhat above the mesial line of this cavity. It is very difficult to distinguish this dislocation, because the length and direction of the limb are but little changed. The extremity is ordinarily half an inch shorter; the *trochanter* is behind its usual

(*a*) Astley Cooper, above cited, p. 66.
(*b*) Nouvelles Espèces de Luxation du Fémur; in Archives générales de Médecine, June, 1824.

place; the head of the thigh-bone can only be felt in emaciated persons, when the thigh-bone is brought forwards as far as possible; the knee and foot are turned inwards, though, however, not so much, as in the dislocation upwards and backwards; when the patient stands he only touches the ground with his toes; the knee is somewhat projected and slightly bent; the limb is fixed in its position.

1070. In the dislocation *upwards and inwards* the head of the thigh-bone gets beneath POUPART's ligament, upon the horizontal branch of the share-bone; it is rare, and produced by violence which thrusts the thigh backwards and the *pelvis* forwards; for instance, a careless step with the foot into a hole, in which case the upper part of the body is bent backwards. The *diagnosis* is easier than in any other dislocation of the thigh. The limb is fixed in strong extension, abduction, and great rotation outwards; it is about an inch shorter, the *trochanter* is nearer the spine of the hip-bone and less prominent; the head of the bone is felt on the horizontal branch of the share-bone; the buttock is flattened and stretched; the vessels of the thigh are twisted inwards, and pulsate distinctly, and even perceptibly, to the eye. In every attempt to bend the thigh, or draw it inwards, severe pain is produced. In old dislocations of this sort it has been found, that the form of the head of the thigh-bone, lying between POUPART's ligament and the share-bone is changed, that it is more flattened, and around the neck a kind of bony collar is produced.

Upon the distinguishing characters between the dislocations of the thigh and fracture of the neck of the thigh-bone see *par.* 671.

1071. As regards the *prognosis* of dislocations of the thigh, they are usually not accompanied with any unfavourable symptoms like those of the shoulder-joint, as after the reduction is completed, in general, the inflammation and swelling soon subside; however, in uncommon cases the inflammation runs on to suppuration, and causes the patient's death (*a*).

The *reduction* of these dislocations is more difficult than all others, especially in robust persons. The dislocations inwards and downwards, and inwards and upwards, are generally more easily reduced than that backwards and upwards. The earlier reduction is attempted, the more quickly is it effected. At what time the reduction of a neglected dislocation is still possible, is probably very different, in different persons, as in some cases it can be effected after some months, but in others, after several weeks is impossible. To what degree the movements of the thigh are hindered by an old dislocation, has been already mentioned, in speaking of the several kinds.

1072. As the reduction of dislocation of the thigh always finds considerable opposition in the powerful contraction of the muscles, so is it in no dislocation of greater consequence than in this, to lessen these contractions by such remedies as effect relaxation in the whole organism. The patient should be bled according to his constitution, should be put in a warm bath, and every ten minutes a grain of tartar emetic given till *nausea* ensues. It must, however, be determined according to the patient's condition, whether previous to the use of these means, an at-

(*a*) ASTLEY COOPER, above cited, p. 7.

tempt at reduction should be made, and if this attempt fail, then to resort to these remedies.

1073. The reduction itself consists in proper extension and counter-extension, which is effected either by assistants or by means of pulleys. Of the former practice in general the French, and of the latter the English surgeons speak in favour. I myself also consider the latter the most certain and most suitable, especially if the dislocation be already of long standing.

1074. In extension and counter-extension by assistants, we proceed in the following manner; the patient lies on a table covered with a mattress: a handtowel folded together (about four fingers wide) is to be placed with its middle on the front of the foot, above the ankle, previously well covered with linen or wool, carried backwards and tied; and its ends given to an assistant. A similar towel is to be applied on the inner side of the sound thigh, also previously defended properly against pressure with a roller, and the one end is to be carried over the flank, the other outwards over the buttock, where the ends are tied and given to an assistant. For the purpose of fixing the *pelvis* still more firmly, a folded cloth is to be carried round it, between the crest of the hip-bone and the *trochanter*, the ends of which are to be tied together on the sound side, and given to an assistant. The number of assistants must be equal at the points of extension and counter-extension. The practitioner places himself on the outside of the dislocated thigh, and directs the extension.

In dislocation *outwards and upwards*, the extension must be made *obliquely from without inwards* and a *little from behind forwards*. When it is sufficiently advanced, the practitioner must with both hands press the *trochanter* downwards and backwards, in order to thrust the head of the bone back into the socket. In dislocation *inwards and upwards* extension must first be made in the direction *outwards*, the practitioner then places both his hands upon the upper inner part of the thigh, and presses it upwards and outwards, whilst the assistants, without giving up the extension, *incline* the lower part of the limb inwards. In dislocation *upwards and inwards*, the extension must be made nearly *in the axis of the body*, and the head of the thigh-bone pressed downwards and outwards. In the dislocation *backwards and downwards*, in which Boyer (*a*) states that it is probably only a secondary displacement in the dislocation upwards and outwards, the head of the bone must be first brought to its previous situation, and then treated as a dislocation upwards and outwards (*b*).

1075. Wattmann, Kluge, and Rust have proposed methods of replacement, in which, by diminution of the muscular contraction, and by rubbing the bones, a less outlay of power is required.

1076. According to Wattmann's (*c*) plan, the patient, lying on his back, is to be merely fixed by resting the healthy limb against the bedstead, and by pressure upon the knee to prevent it being bent. Only in great resistance of the muscles, should the *pelvis* be fixed by a long cloth carried above the hip, and fastened to a rafter between the two

(*a*) Above cited, p. 288. (*b*) Ibid., p. 302.

(*c*) Ueber Verrenkung am Hüftgelenke und ihre Einrichtung. Wien, 1826; with a copper-plate.

bedposts. For the abduction of the thigh, a strap furnished with a roller is sufficient; one or two assistants are employed.

In the dislocation *inwards and downwards*, the thigh-strap is applied as high as possible, upon the thigh, with the buckle forwards; an assistant lays hold of the dislocated foot, in the position in which it is kept by the dislocation, above the ankle, and holding firmly, draws it slightly downwards. The surgeon standing near the patient, rests with the one hand upon the crest of the hip-bone, and with the other hand so seizes on the bandage, that it is directed under the fore and upper iliac spine, and crosses the axis of the thigh at a right angle. He then, with the requisite force, pulls outwards parallel to the direction of a line which may be supposed to be drawn a hand's breadth behind the anterior upper iliac spine on the sound side, through the body to the tip of the same process on the ailing side. In this way the extensors and flexors are but slightly stretched, and the rotating muscles first participate in the flexion, when the head approaches the edge of the socket. By the ordinary flexion of these muscles the head may be lifted into the socket.

In dislocation *inwards and upwards*, an assistant lays hold of the ailing foot above the instep, carries it upwards upon the outside of the sound foot, and keeps it in this position without drawing, whilst the pull, with the bandage, applied as in the former case, is made by the surgeon in a line supposed to be drawn from the tip of the fore and upper iliac spine of the sound side towards the *trochanter* of the dislocated thigh outwards, and obliquely upwards. So soon as the toes hitherto pointing outwards, become pointed forwards, a slight pull at the ankle in the direction of the long axis of the thigh-bone, furthers its elevation into the socket, which is effected by the extended rotating muscles.

In the dislocation *backwards and downwards*, the foot is grasped by an assistant above the ankle, and drawn over the sound limb across and downwards. The bandage, applied as above described, is drawn gradually and strongly outwards and forwards, in the direction of a line parallel to one supposed to be drawn two hands' breadth behind the fore and upper iliac spine of the sound side through the body to that of the injured side. The drawing is to be continued, till the thigh itself turns outwards on its long axis, when the head of the bone is pulled into the socket, by the much stretched rotating muscles.

In dislocation *outwards and upwards*, the thigh may either be drawn in its own axis forcibly downwards, and by the thigh-strap outwards and downwards, or an assistant must grasp the dislocated thigh in its axis inwards at the knee and ankle, and slowly lift it forwards, till it forms a right angle with the long axis of the body, and till the fore, still inner edge of the great *trochanter*, comes directly beneath the fore and upper iliac spine. If the thigh be yet of itself so much twisted on its long axis that the hitherto inwards turned toes are twisted forwards, and even rather outwards, and by this self-twisting of the thigh, which cannot be prevented by fast holding, is the movement of the head of the bone over the socket declared. The assistant must now gradually let down the thigh till it lies close to the other, upon the bed, whereupon the reduction follows.

1077. In order to properly fix the *pelvis*, the patient must (according to KLUGE) (*a*) be laid on his back, upon a table covered with a mattress, and between the thighs, covered with a compress, a stout towel drawn, of which both ends must be held by an assistant standing at his head; a second towel is to be carried round the *pelvis*, and both ends given to an assistant standing on the uninjured side of the patient; a third towel is to be placed around the *pelvis*, between the spines of the hip-bone and the *trochanter* carried round the table or bedstead, and tied so as to prevent the elevation of the *pelvis*. The thigh and leg are now bent by an assistant, to relax the flexors, and at the same time abducted, to relieve the stretching of the gluteal muscles, and the knee should be rotated inwards, by which the head of the bone, being set free, resumes its primary direction, whilst the capsular ligament holds it fast above. The head of the bone is guided from its primary direction usually by a slight twist or pull at the knee, or it is lifted up by the surgeon, standing at the injured side, partly with his hands, partly with a cloth employed as a lever.

According to RUST'S (*b*) plan the patient being fixed as recommended by KLUGE, a folded cloth is to be applied around the upper part of the thigh; the thigh drawn down, and at the same time raised by a strong assistant, who grasps it above the knee, which is to be bent, for the purpose of bringing the head nearer the under part of the socket; then it is to be drawn and abducted, upon which, by the action of the muscles, it springs into the socket with an audible noise, without the employment of any considerable extension being requisite.

COLOMBAT (*c*) proposes a mode of reduction which he has always successfully employed without assistance and without pain to the patient. The patient stands upright upon the undislocated limb, his chest bent forwards and resting on a table or high couch, with his hands grasping the opposite sides of the table or couch, to keep his body immoveable during the operation. The surgeon places himself behind the patient, on the inside of the dislocated limb, if the dislocation be forwards, but on the outside if it be backwards. He puts first one hand above the *tarsus*, to bend the leg upon the dislocated thigh; the other hand, which lies behind the knee, is employed to make gradual pressure from above downwards, for the convenience of extending the muscles. With the first hand he imparts to the limb gentle motions from right to left, and from before to behind, in order to overcome the opposition of the muscles of the thigh, and to render the head moveable, which then moves from the place in which it is, and enters the socket with a noise.

1078. In the reduction of dislocations of the thigh with pulleys, the following mode is to be pursued.

In the dislocations *backwards and upwards*, the patient should be placed upon a table, and a girth carried between the *pubes* and upper part of the thigh, outwards and upwards, and fastened to a hook behind the patient. Above the knee should be applied, around the thigh, a linen pad, and over it a leathern strap, from which other straps descend, and are connected with the pulley fastened before the patient. The knee is to be a little bent, but not at a right angle, and directed somewhat obliquely over the other limb. The drawing of the pulley is to be slowly continued, till every thing is tight and the patient complains of pain; this degree of extension should be kept up to relax the muscles; then it is to be repeated till the patient complains, and in this manner continued till the head of the bone comes down. When it comes to the edge of

(*a*) SICH, G. R., Dissert de luxatione femoris. Berol., 1823, p. 26.
(*b*) RICHTER, above cited, p. 706.
(*c*) Ueber die Merotropie bei den Luxationen des Hüftgelenkes; in FRORIEP'S Notizen, Sept, 1830.

the socket, the same degree of extension must be kept up, and the knee and foot rotated outwards without violence. It is often necessary to carry the arm beneath the thigh, near to the joint, for the purpose of lifting the head of the bone over the socket.

In the dislocation, *inwards and downwards*, the patient is to be put on his back, the *pelvis* fixed with a girth, as in the latter case, the dislocated limb grasped above the ankle and drawn over the uninjured one. In general, however, it is necessary further to fix the *pelvis* by means of a second strap, which passes around it and crosses the former. If the dislocation have existed several weeks, it is best to put the patient on the sound side, to fix the *pelvis* in the manner mentioned, to apply the girth attached to the pully around the thigh, and to raise the thigh when the foot is drawn down; the foot, however, is not to be brought too much forwards because otherwise, the head of the thigh-bone overshoots the socket (*a*).

In the dislocation *backwards and downwards*, the patient must be placed on his side, the straps for extension and counter-extension employed as directed, and the extension carried on, the thigh at the same time being directed obliquely over the middle of the other. Whilst this is doing, an assistant grasps a cloth, applied round the upper part of the thigh, with one hand, and draws it up, whilst with the other he presses up on the *pelvis* (*b*).

In the dislocation *inwards and upwards*, the patient is laid upon his side, the *pelvis* fixed, and extension made above the knee. The thigh is drawn in the backward direction, around its upper part a cloth applied, which an assistant draws, whilst with the other hand he thrusts back the *pelvis*, in order to lift the head of the bone over the edge of the socket (*c*).

The reduction of the dislocation inwards and upwards, is often rendered more easy and quick than in the other way, by Palletta's method, in which the dislocated thigh is suddenly and violently bent towards the belly, when it has been abducted as much as possible (*d*).

[In the dislocation downwards Astley Cooper used to say, in his Lectures, that it might be reduced by interposing the bedpost between the thighs close up to the *pelvis*, and then making extension.

Morgan and Cock, of Guy's Hospital, have reduced several dislocations of the hip-joint by placing the foot between the thighs, so that it presses against the upper part of the dislocated bone, and thrusts it away from the *pelvis*, extension and rotation of the limb being at the same time made by assistants. The principle of the operation is precisely similar to that in reducing a dislocated shoulder by putting the heel in the arm-pit. This practice was first introduced about ten years since by Morgan (*e*), and by it he has replaced a dislocation upon the *pubes*, one on the oval hole, and one upon the back of the hip-bone, without difficulty, which he principally attributes to diverting the patient's attention from the operator's efforts by unexpectedly pricking or pinching. Cock has reduced one dislocation on the *pubes*, and two on the back of the hip-bone, by the foot between the thighs; but he informs me that the greater number of the persons so treated were weak or elderly. Till making inquiry, I was unaware of so many cases having been thus managed, I do not know that the practice has been elsewhere adopted, but I shall certainly try it, at the first opportunity, as it saves all the trouble and inconvenience of *pelvis*-straps and pullies.—J. F. S.]

(*a*) Cooper Astley, pl. viii. fig. 2.
(*b*) Ibid., pl. ix. fig. 3.
(*c*) Ibid., fig. 4.
(*d*) Bulletins des Sciences par la Société Philanthropique de Paris, 1818, p. 285.—Ammon, Parallel, p. 170.
(*e*) Guy's Hospital Reports. vol. i. p. 79.

1079. The completion of the reduction of a dislocated thigh-bone is indicated by the audible noise, with which the head returns into the socket, by the natural length and direction of the limb, by the cessation of pain, and by the free motion of the thigh. The replaced thigh is frequently longer than the sound one, which depends on the swelling of the ligaments of the joint. In using the pulleys, the head of the bone often returns into the socket without any noise, and the reduction is only noticed when the extension is given over. If the extension have not been sufficient, it must be resumed as quickly as possible, before the muscles have time to contract afresh. In order to prevent the recurrence of dislocation, it is advisable to bind the thighs together above the knees, and to keep the patient at rest, and on his back in bed. He is to be treated generally and locally on the antiphlogistic plan, according to circumstances, and allowed to get up and walk, when the pain has entirely ceased, which usually happens towards the twenty-fifth or thirtieth day.

1080. *Congenital* dislocation of the thigh, *outwards and upwards*, into the external iliac pit, *(Luxatio Femoris congenita)*, mentioned formerly by Hippocrates, and more perfectly described by Palletta (*a*), was first carefully described by Dupuytren (*b*), and I have, up to the present time, had opportunity in more cases, to convince myself of the correctness of his description. It is distinguished from all other dislocations, especially from spontaneous dislocation, in that, 1, it ordinarily occurs in both hips; of the nine cases, however, which I have seen, in four the dislocation was only on one side (*c*); 2, it is not preceded by any symptoms of coxalgy; and 3, it is usually first noticed in the first attempts the child makes to learn to walk, and if the attempt be continued, till the movements become wearisome. The limb in this dislocation is shortened, the head of the thigh-bone is upwards and outwards, the great *trochanter* projects; almost all the muscles of the upper part of the thigh are contracted to the iliac crest, where they produce, around the head of the bone, a sort of cone, the base of which is formed by the hip-bone, and its point directed towards the great *trochanter;* the tuberosity of the haunch-bone is freed from its muscles, and is almost completely uncovered; the limb is rotated inwards, the heel and the bend of the knee stand outwards, and the point of the toe and the knee inwards; the thighs are directed obliquely from above downwards, and from without inwards, and this obliquity becomes greater, the older is the patient and the broader the *pelvis;* hence arises the disposition of the thighs to cross each other below; the upper inner part of the thigh forms where it is connected with the *pelvis*, a sharp inward projecting angle; the whole limb wastes, especially at the upper part. The motions of the limb are very much restricted, especially abduction and rotation; the lower limbs are very backward in proportion to the perfectly developed upper parts of the body, which is the more remarkable as the *pelvis* is very broad, and not interfered with in its development. The upper part

(*a*) Exercitationes Pathologicæ, p. 88.

(*b*) In Répertoire générale d'Anatomie et de Physiologie Pathologique, vol. ii. trimestre iii. p. 151. Froriep's Notizen, No. 340, p. 153, and Chirurg. Kupfertafeln, pl. clxxx. Caillaud Billoniere sur les Luxations originelles ou congénitales du Fémur. Paris, 1828.

(*c*) On the Hip; noticed in Répertoire général d'Anatomie et de Physiologie Chirurgicales, 1827, trimestre iii. p. 22.

of the body inclines very much backwards; on the other hand, the lumbar *vertebræ* project much forward, the *pelvis* rests nearly horizontally upon the thigh-bones, and these persons touch the ground almost alone with the tips of their feet. When walking they raise themselves on the tips of their feet, bend the upper part of the body very much towards that limb which still supports the weight of the body, raise the other foot from the ground, and bring, with difficulty, the latter from one side to the other. In this case, it is to be observed, that on the side supporting the weight of the body, the head of the thigh-bone rises up into the iliac pit, and the *pelvis* descends, whilst, on the other side, the displacement of the bone is lessened. In running and leaping, which for such persons is very laborious, these appearances diminish from the energy of the muscular contraction. When the person lies horizontally on his back, the diseased limbs may, by pulling and thrusting down, be lengthened and shortened, and are hence distinguished from the changed position of the head of the bone. These experiments may be made without pain and with the greatest ease.

1081. In the cases examined after death by Dupuytren, all the muscles appeared pressed against the iliac crest, and drawn up; some of them were very much developed, others shrivelled, atrophic, and even converted into a yellowish fibrous tissue. The thigh-bones were naturally formed, and only sometimes the inner upper part of the head varying somewhat from its rounded form. The socket was either entirely deficient, or appearing only as a little irregular bony protuberance, without any trace of cartilage and ligament, and without any fibro-cartilaginous edge; and about and over it, the cellular tissue and the muscles attached to the *trochanter*. Only in one case was the sound ligament lengthened, flattened, and at some parts, as it were, worn out by pressure and friction. The head of the bone was found in a kind of newly formed socket on the external iliac pit, always very superficial, and having an undefined edge. Palletta found the under forepart of the socket covered with ligament, and the upper hinder-part filled with a fat-like mass; the head of the bone round, enclosed in a tough capsule, connected with the fatty mass in the socket by the round ligament, which was so long that it permitted the head to move upwards and downwards, and aside. No hollow in the bone in which the head of the thigh-bone should rest, had been formed in a child who had died sixteen days after birth. Hence, it seemed, that the above-mentioned absence of socket, and so on, was not original, but only consequent, and that this dislocation was, perhaps, simply produced by the peculiar position of the *fœtus*, or by violence during birth. The flattening, or almost complete disappearance of the socket, is explained by the long continuance of the dislocation, and must be so much more distinct in the congenital, as in the progressive development of the pelvic bones it so easily occurs. The opinion, that the congenital dislocation depends on an arrested development of the bony parts of the joint (Breschet) is very improbable, rests only upon the relations of the socket, after the dislocation has been long existent, and remains refuted by Palletta's and Cruvelhier's cases, till it can be determined by examination at the very earliest period after birth.

Compare *par.* 998 and the writers there quoted.

1082. Difficult as is the walking, and great as the lameness in this congenital dislocation, especially when on both sides, yet however it may be, in time, considerably improved when the head of the bone is fixed in its new socket (1). Dupuytren recommended rest and a sitting posture to effect the fixing of the head of the bone, and to permit the muscles, as little as possible, to act upon it; for strengthening the parts in the neighbourhood of the joint, daily washing of the body for some minutes in cold water, or salt water, and the constant wearing a padded leathern belt, put on between the iliac crest and the great *trochanter*, and kept in its place by thigh-straps.

Recently, various attempts for the *reduction* of this dislocation, have been made by long-continued extension, and fixing the thigh with proper apparatus. (Duval, Jalade Lafond, Humbert, Pravaz (2), Guerin.) The possibility of a successful result is not, as already said in regard to the origin of this dislocation, to be considered as a thing decided, and must excite us to the early employment of the means of reduction; although the hitherto known cases do not irrevocably prove the actually resulting reduction, as the lengthening of the limb effected, and the diminished lameness, perhaps, depend on the displacement of the *pelvis*, or the position of the head of the thigh-bone in the ischiatic pit.

(1) I have observed one case of dislocation on both sides, in which the walking was at first extremely difficult, but from the fifteenth year and onwards so improved, that now, when the patient is about twenty years old, there is scarcely any trace of peculiar gait to be noticed.

(2) Pravaz (*a*) communicates a case of reduction of congenital dislocation of the thigh, in a girl eight years old, by gradual lengthening of the limb, and by violent abduction, assisted by a methodical pressure on the great *trochanter*. If the reduction be ensured by long-continued rest, various movements of the limb should be performed, the body still being at rest. He believes that even in the cases in which there is not any existing cotyloid cavity, a dislocation of the head of the thigh-bone downwards causes slight halting. A second case happened in a boy of eight years, in whom the reduction was effected by gradual extension, kept up for several months, after which gymnastic exercises were used, which were proper for strengthening the joint and perfecting its coaptation (*b*). Guérin effected a cure in six cases. H. Joffre (*c*) refers to the two cases of Pravaz, denies the observations of Humbert (*d*), and thinks that in them no perfect reduction was found, but that merely the head of the bone was situated in the ischiatic pit.

Heine, of Cannstadt, has given a very clever apparatus, which, with continued extension, permits every other seemingly necessary movement and direction of the extremity. But notwithstanding all his care and perseverance, he could not, in this dislocation of the thigh, effect any result (*e*).

Guérin (*f*) makes a preparatory and continued extension, by which the shortened muscles are lengthened and are brought to stretch out; cutting through the muscles which do not lengthen; extension of the shortened ligaments, and where this is impossible, cutting them through; reduction and its preservation by apparatus. According to Pravaz (*g*) every congenital dislocation may be reduced, if it be pos-

(*a*) Révue Médicale, April, 1835.

(*b*) Annales d'Hygiène publique; in Froriep's Notizen, No. 122.

(*c*) Journal des Connaissances Medico-Chirurgicales, May, 1838, p. 180.

(*d*) P. Humbert and N. Jacquier, Essai et Observations sur la manière de réduire les Luxations spontanées ou symptomatiques de l'Articulation ileo-fémorale; méthode applicable aux luxations congénitales et aux luxations anciennes par cause externe. Paris, 1835; with Atlas of 20 plates.

(*e*) Ueber spontane und congenitale Luxationen, so wie über einen neuen Schenkelhals-Bürch-Apparat. Stuttgardt, 1842.

(*f*) Gazette Médicale de Paris, 1841. No. 7–10.

(*g*) Bulletin de l'Academie Royale de Médecine, vol. vii. p. 5.

sible to bring the thighs up to the shoulders, without bending the legs against the thighs (*a*).

OF DISLOCATION OF THE KNEE-CAP.

(*Luxatio Patellæ*, Lat.; *Verrenkung der Knieschiebe*, Germ.; *Luxation de la Rotule*, Fr.)

Le Vacher et Picquet, Theses de variis patellæ luxationibus. Paris, 1761. 4to.
Boyer, above cited, vol. iv. p. 347.
Cooper, A., above cited. p. 178.
Malgaigne, Mémoire sur la détermination des diverses espèces de Luxation de la Rotule. Paris, 1837.

[Watson, On Dislocations of the Patella, in New York Journ. of Med. and Surgery, No. 2, p. 203.—G. W. N.]

1083. Dislocation *of the Knee-cap* may happen in two different directions, viz., *outwards* and *inwards;* the former kind of displacement is much more common than the latter. These dislocations may be complete or incomplete; in the first the cap leaves the joint-surfaces of the thigh-bone, and rests on one or other protuberance; in the second it still partially touches the corresponding surface. *Diagnosis* of dislocation of the knee-cap is always easy; the limb is outstretched; and if it be attempted to bend the leg, the pain is increased; the knee has lost its natural form. In dislocation *outwards* the prominence of the inner condyle is felt through the skin, and upon the outer condyle, and if the dislocation be complete on its outside, a considerable swelling is produced by the knee-cap. In dislocation *inwards*, the outer condyle is felt and the prominence of the knee-cap on the inner condyle. This dislocation is nearly always incomplete.

Coze's observation of a dislocation of the knee-cap, in which it was half twisted round itself, has been denied (*b*).
Wolf (*c*) has noticed a complete twisting round of the knee-cap.

[Gazzam has given a like case in the American Journ. of Med. Sciences.—G. W. N.]

1084. The causes of dislocation of the knee-cap are mostly, external violence acting on the bone in moderate bending, or complete straightening of the leg, and after driving it to one or other side. Also any circumstance by which the foot is turned outwards whilst the knee turns in, may produce this dislocation. If the ligaments of the knee-cap be very relaxed, or the condyles of the thigh little prominent, this dislocation may be produced by slight causes.

In general, dislocations of the knee are not dangerous; but when the violence producing them acts very severely upon the knee-joint serious symptoms may be caused by the contusion.

1085. In *reducing* this dislocation, which cannot always be effected at the first attempt, the patient should be laid upon his back, the leg straightened as much as possible, and the thigh bent at the hip-joint, the knee-cap is then to be pressed directly forwards, and when its great ridge is lifted over the edge of the condyle, it is drawn into place by the

(*a*) A. Sanson; in Rév. de Spécialitiés, 1841, Feb.—Journal de Médecine de Lyon, 1841, Nov. p. 381.
(*b*) Mém. de la Société d'Emulation. Paris, 1826, vol. xviii.
(*c*) Rust's Magazin, vol. xxvii. p. 476.

action of the muscles. The knee should be enveloped in cloths dipped in a dispersing wash; and the patient kept quiet in bed till the pain and swelling have ceased. Should the knee-cap be disposed again to be dislocated, the knee must be supported by means of an elastic knee-bandage.

I have seen a *congenital dislocation* of the knee-cap on both sides, in an aged man. The knee-cap rested entirely on the outer side, so that the middle of the knee-joint was completely void. The knee-cap was so moveable, that in the straight position of the leg it could easily be brought to its proper situation, but on the slightest movement was again displaced. Both knees were very much twisted inwards, the legs and feet very much outwards. The man's gait was very difficult and unsteady. Palletta (*a*) has examined a case of congenital dislocation of the knee-cap.

XII.—OF DISLOCATION OF THE KNEE-JOINT.

(*Luxatio Genu*, Lat.; *Verrenkung des Kniees*, Germ.; *Luxation de Genou*, Fr.)

von Siebold's Chiron., vol. i. p. 33.
Boyer, above cited, vol. iv. p. 365.
Cooper, A., above cited, p. 184.

1086. Dislocations of the knee are rare, on account of the great strength of the joint. The shin-bone may, however, be displaced forwards, backwards, and to one side or other from the joint-surfaces of the thigh-bone. These displacements are mostly incomplete. The ligaments and tendons which strengthen the knee are always in these dislocations, either much torn or much stretched; even the vessels and nerves may be torn, or the joint-ends of the bones thrust out through the skin. These dislocations cannot be mistaken, on account of the projections which the shin-bone and condyles of the thigh form in opposite directions.

1087. The *reduction* of these dislocations is not usually accompanied with difficulty. Sufficient extension of the leg is made, and then the displaced joint-end of the shin-bone is pressed into its place, one hand grasping it, whilst the other has hold of the lower end of the thigh-bone. After the reduction, inflammation must be prevented or got rid of, and the union of the ligaments effected, by strict antiphlogistic treatment, and by keeping the limb quiet, fastening it up in a pair of splints. When all swelling and pain have subsided the limb may be cautiously moved. If the joint remain weak, volatile rubbings must be employed, and a knee-band used for some time to give support. If the inflammation be severe, *anchylosis*, suppuration, gangrene, and so on, may take place, and the treatment must be guided according to the rules laid down for wounds of joints. If the joint-ends of the bones be thrust through the skin, there may be such destruction, that immediate amputation is requisite. Single cases in which the preservation of the limb is possible cannot refute these principles.

If the ligaments connecting the semi-lunar cartilages with the shin-bone be relaxed, they may by external violence, by pushing with the toes of the outward-turned foot and so on, remove the semi-lunar cartilages from their position. At the same time severe pain, swelling, incapability of stretching out the foot, without

(*a*) Exercitationes Pathologicæ, p. 91.

much alteration of form in the knee come on. The natural position of the cartilages is most certainly restored, when the leg is bent back as much as possible, by which the pressure of the thigh-bone on the semi-lunar cartilages is removed, and they return to their place, when the leg is extended. The weakness of the joints is to be removed, by volatile rubbings and the like, and the recurrence of this accident prevented, by a properly applied knee-band (Astley Cooper.)

Wutzer (*a*) observed a *congenital* bending forwards of both legs, depending on dislocation at the knee-joint. Kleberg (*b*) describes a *congenital* dislocation of the left knee forwards, where, with the thigh extended, the leg was bent forward at the knee, and lay obliquely upwards in such way, that the points of the toes touched the right side of the belly; the legs could be easily returned to their natural position; they, however, immediately resumed their previous position, whilst the child himself had not any voluntary influence over their movements. Bending the leg back against the thigh to an obtuse angle, and fixing it in this position, by a thin cloth passed round the middle of the thigh and leg, in a short time restored the natural position and mobility of the leg.

XIII.—OF DISLOCATION OF THE SPLINT-BONE.

(*Luxatio Fibulæ*, Lat.; *Verrenkung des Wadenbeines*, Germ.; *Luxation du Péroné*, Fr.)

Boyer, above cited, vol. iv. p. 375.

1088. The *splint-bone* may be dislocated at its upper or lower end, *forwards* or *backwards*. This can always be readily distinguished, as the head of the bone can be felt if there be not any considerable swelling.

In order to *reduce* this dislocation, it is only necessary to press the dislocated head into its place, and to fix it there with compresses and bandages. The dislocation of the upper end may be accompanied with fracture of the shin-bone, in which with the reduction of the fracture follows also that of the dislocation. Not unfrequently, owing to relaxation of the ligaments, dislocation of the upper end of the splint-bone takes place; its reduction in this case is easy, but just as speedily does the displacement recur. The bone is to be kept in place by rest, and by fixing it with bandages; the weakness of the joint should be sought to be removed by friction, blistering, and the like.

XIV.—OF DISLOCATION OF THE ANKLE-JOINT.

(*Luxatio Tali*, Lat.; *Verrenkung des Fusselgelenkes*, Germ.; *Luxation du Pied*, Fr.)

Desault, above cited, vol. i. p. 423.
Boyer, above cited, vol. iv. p. 375.
Cooper, Astley, above cited, p. 238.
Dupuytren; in Annuaire Medico-Chirugical des Hôpitaux et Hospices de Paris. Paris, 1819. 4to.; with copper-plates.

[Baxter, A Memoir on Accidents of the Ankle; in N. York Med. Repository, vol. vi. N. S. 1821.—G. W. N.]

1089. Dislocations *of the foot* are frequent, and may occur *inwards* and *outwards*, *forwards* and *backwards;* the dislocation inwards is the

(*a*) Müller's Archiv. für Anatomie und Physiologie, 1825, pt. iv. p. 385.
(*b*) Hamburger Zeitschrift, vol. vi. pt. ii.

most common; those forwards and backwards are much rarer than those on either side. They are generally complete or incomplete, simple or compound.

1090. In the dislocation *inwards*, produced by violent turning of the foot outwards, the joint surface of the *astragalus* is placed beneath the inner ankle, and the lower end of the shin-bone so thrust inwards, that the skin is ready to burst by its pressure; the inner edge of the foot is inclined downwards, the outer upwards, the sole of the foot outwards and its back inwards. This dislocation may be accompanied with considerable tearing of the ligaments, with fracture of the outer ankle or of the middle of the splint-bone, or of the lower end of the shin-bone, the soft parts may be torn, the joint surface of the *astragalus* or of the shin-bone be thrust through the skin, or there may be at the same time dislocation of the *astragalus* from its connexion with heel- and navicular bones. In the latter case, the integuments are often uninjured, and the ligaments between the *astragalus*, heel-, and navicular bone suffer only considerable extension; often, however, are all these ligaments and integuments so torn, that the *astragalus* is merely attached at some parts.

The dislocation *outwards*, is consequent on violent inclination of the foot inwards; the *astragalus* is thrust beneath the outer ankle, the inner edge of the foot is turned upwards, the outer inwards, the sole inwards, the back outwards. This dislocation may be connected with fracture of the lower end of the splint-bone and of the inner ankle. Usually is there also in lateral dislocation, a more or less decided inclination of the foot forwards or backwards.

1091. The symptoms mentioned of lateral dislocation are so distinct that it cannot be mistaken even when considerable swelling has taken place. But this swelling may render difficult the *diagnosis* of the different complications.

1092. In dislocation of the foot *forwards*, which arises from violent extension of the foot, and is rarer than that backwards, the joint-surfaces of the *astragalus* are in front of the shin-bone, the foot fixedly bent, the heel shortened, and the Achilles' tendon nearer the back of the leg.

In dislocation *backwards*, which may be consequent on a fall, with the sole of the foot on an oblique surface, the foot is outstretched and shortened, the heel more prominent, the Achilles' tendon projects from the back of the leg, the joint-surface of the *astragalus* is felt on the back of the shin-bone, the under end of which forms a hard projection on the middle of the instep and rests on the navicular bone and only on a small portion of the articular surface of the *astragalus* in front. This dislocation is always accompanied with fracture of the splint-bone of the inner ankle, or the latter is torn off.

This dislocation may be incomplete, so that the shin-bone rests half upon the navicular, whilst the other half remains on the *astragalus*. The foot then seems but little shorter, the heel projects a little, the toes are pointed downwards, so that the patient cannot put the whole sole of the foot on the ground, the heel is drawn up, and the foot to a great extent immoveable; the splint-bone is broken.

1093. Dislocations of the foot are always important, because they pre-suppose great violence; and severe inflammation, and dangerous symptoms ensue from the tearing of the ligaments and from the dragging of the tendons and soft parts. Even in slighter degrees, stiffness of the joint is to be feared. There often remains so great weakness of the ligaments of the joint that the dislocation is reproduced by the slightest effort, if the joint be not strengthened by some mechanical apparatus. The dislocations forwards and backwards, are generally less dangerous, than the lateral dislocations and rarely accompanied with evil complications. Even if the dislocation be not reduced, the foot is not completely unfit for use; but very considerable deformity remains. Lateral dislocations are not always equally dangerous; they often are soon cured without any weakness or interference in the motions of the joint remaining. Dislocation outwards is mostly accompanied with more injury than that inwards. Simultaneous fracture of bones or tearing of soft parts render the case so much more dangerous; though experience shows that, in most cases, the limb may be preserved.

1094. The *reduction* of dislocation of recent occurrence, is usually not very difficult. The patient lies down, one assistant grasps with both hands the lower part of the shin-bone, and another, or in dislocation aside the surgeon himself takes hold of the foot. The former makes counter-extension in the direction of the shin-bone, the other extension, (in which the leg is bent at right angle on the thigh), first in the direction which the foot had, and when the ligaments and tendons are sufficiently stretched, he brings the foot into its proper place. In dislocations *backwards*, the surgeon with one hand presses the heel forwards, and with the other the shin-bone backwards, and the contrary in dislocation *forwards*. Complete reduction is indicated by the natural direction and form of the foot and its capability of motion. The ankle-joint should then be enveloped in linen, dipped in dispersing fluid, and fastened with a circular bandage applied in a figure of ∞ form. Chaff bags are to be applied on each side of the leg and splints upon them which extend over the ankle-joint as in fracture of the leg. The leg must always be bent at the knee-joint, and laid on a cushion, to relax the muscles. Antiphlogistic treatment must be employed proportionate to the constitution, the dressings moistened with dispersing fluid, and replaced every five or six days. When the pain and swelling have subsided, careful motion must be used, but only after a month, may the patient be allowed to walk gently about.

If dislocation of the foot *inwards*, be accompanied with fracture of the splint-bone, its re-dislocation is most effectually prevented by the apparatus used for fractured splint-bone, which may be also applied in dislocation *outwards*, the splint with the chaff bag being put on the outside of the leg. In dislocation of the foot *backwards*, re-displacement may be prevented by placing a splint and cushion beneath it, (so that both project beyond the heel), and a small cushion on the lower part of the shin-bone, which is here, as well as at the knee, to be fastened with a bandage (*a*). In dislocations aside, many persons recommend that the limb should be laid on its outside with the leg bent, and the foot enveloped in the many-headed bandage.

[Sometimes in dislocation of the ankle-joint inwards, the internal lateral ligament is torn through without the malleolar process being broken off. This is a rare acci-

(*a*) Dupuytren, above cited.—Chirurgische Kupfertaf. Weimar, 1820, pt. ii. pl. vi. fig. 5.

dent, and very difficult to keep in place if there be any disposition to spasm, of which there is an example in a case of Henry Earle's (*a*). The splints were consequently applied more tightly, and perhaps from that cause irritation set up, which terminated in abscess, which was twice opened. The soft parts about the ankle-joint became sloughy, and the patient's violent efforts whilst delirious, thrust the bone through the mortified skin, and it could no longer be at all kept in place. Amputation was performed, but the case terminated fatally.]

1095. If in dislocation of the foot, the joint-end of the shin-bone be driven through the integuments, so soon as it has been properly cleansed, its replacement must be attempted, the wound carefully closed, and the treatment conducted after the general rules. If the narrowness of the wound prevent the reduction, it must be sufficiently enlarged; and if it cannot be then effected, the projecting bone must be sawn off, whereby alone, the natural position of the foot can be restored, and dangerous symptoms prevented. Amputation is only inevitably necessary, in old weakly persons, in very extensive tearings and crushings of the bones, on the occurrence of mortification and wasting suppuration. If in dislocation *outwards*, the shin-bone be broken obliquely, near its joint surface, it cannot be kept in place after reduction, and amputation may be indicated. It may also be necessary in cases of continuing very troublesome deformity.

[In compound dislocation of the ankle-joint with protrusion of the shin-bone through the wound, most English surgeons saw off the joint end, not merely to render reduction more easy, but also, according to Astley Cooper's opinion, to lessen the suppurative process, by diminishing the synovial surface. This mode of practice is certainly not commonly followed in reference to other joints, and the younger Cline was always opposed to it being resorted to in dislocated ankle. It must however be admitted, that Cooper's reasoning as well as practice favours the proceeding.—J. F. S.]

XV.—OF DISLOCATIONS OF THE INSTEP-BONES.

(*Luxatio Tarsi*, Lat.; *Verrenkung des Fusswurzelknochen*, Germ.)

1096. The connexions of the bones of the instep are so firm, partly from the strength of their ligaments, and partly from the broad surfaces by which they touch, and their motions are so confined, that their dislocation is extremely rare, and only possible from very great violence, therefore, also commonly accompanied with tearing of the soft parts.

1097. *Dislocation of the Astragalus* may, notwithstanding its situation in the hollow formed by the shin- and splint-bones, and its firm fastening to the heel- and navicular bones, occur in four different directions, in which it may be thrown *forwards*, *inwards*, or *outwards*, from its connexion with the navicular, or it may be *so twisted on its axis*, that its under joint surface is turned upwards. The dislocations forwards and inwards are more common than that outwards (1). These dislocations may be connected with fracture of the shin- or splint-bone, with dislocation of the foot, with tearing of the soft parts and protrusion of the head of the *astragalus*. The cause is violence, which displaces the foot and leg at

(*a*) Medical Gazette, vol. iv. p. 61, 1829.

its greatest degree of extension, as in a fall from a height, when the sole of the foot lights on an oblique surface, and the body falls backwards; or a fall of the body backwards, whilst the fore part of the foot is fixed, so that the shin-bone is brought into a nearly straight direction with the foot. In this position the lower end of the shin-bone presses on the back of the *astragalus*, drives it forwards, and tears the astragalo-tibial ligament, and lets go the head of the *astragalus* from the hollow of the navicular bone. It is therefore intelligible, why dislocation does not occur when the shin-bone breaks, and this dislocation takes place, especially in powerful, healthy persons, whose bones are strong. In dislocation *inwards*, indeed there is always fracture of the lower end of the splint-bone. Most probably the head of the *astragalus* is always primarily dislocated forwards from the navicular bone, and driven according to the direction of the operating force, inwards or outwards. In *twisting round* of the *astragalus on its axis*, it must be driven from behind, forwards, and from below, upwards, with a very great thrust of the shin-bone upon the foot and leg, whilst extended to the utmost, with which the skin yielding, indeed, though resisting, and the inter-osseous ligament must be torn through.

(1) When Rognetta supposes that dislocation of the *astragalus inwards*, if not impossible, yet is in the highest degree difficult, because the cleft between the navicular bone and *astragalus* is filled by exceedingly strong ligaments, the capsule between the two bones in front too weak and extensible, and because the violence causing the dislocation of the head of the *astragalus*, as the cases, known to the present time, show greater frequency of the dislocation inwards, than of that outwards. In his experiments, Rognetta has never been able to produce any other dislocation of the *astragalus* than that forwards.

[The dislocation *outwards* is very rare; besides James's, of Croydon, case (*a*), and two other under Guthrie's care (*b*), I know of none save one now under my friend Stanly's care in St. Bartholomew's Hospital, and which had occurred in consequence of the young man slipping off the fourth round of a ladder, the appearances of which correspond very closely to the description given by Astley Cooper, but there is not any fracture of the splint-bone. Violent attempts had been made for its reduction before his admission into the hospital some days after the accident, but, as in the other three cases, without success. Reduction was also attempted two or three days after his admission into St. Bartholomew's but they also were quite unavailing, and the displacement still remains.

Of these cases James's was the only one in which there was fracture of any bone, and in that the inner *malleolus* was broken obliquely.—J. F. S.]

1098. In dislocation of the *astragalus forwards*, the projection of the head of that bone upon the navicular, is felt on the instep, the toes are depressed and turned somewhat outwards. In the dislocation *inwards*, the projection is more to the inner side, and the toes turned more outwards (1); and in dislocation *outwards*, the prominence of the head of the *astragalus* upon the cuboid bone, and the foot is so turned inwards, that the outer edge is directed downwards, and its inner, upwards. With much swelling the diagnosis is difficult, and even impossible (Boyer). If the soft parts be at the same time torn, the head of the *astragalus* either protrudes or may, with the finger, be felt bared. In dislocation of the *astragalus with twisting on its axis*, it may be so locked in between the shin-bone and heel-bone, that the limb appears

(*a*) Cooper, above cited, p. 359.

(*b*) Hancock's Paper; in Med. Times vol. ii. 1844, p. 71.

longer. If, however, this be not always the case, this sign is extremely important, in order to suspect such dislocation, and always to avoid, in such cases, useless and prejudicial attempts of extension and counter-extension (Rognetta).

(1) The younger Cline's case of simple dislocation; and Green's case of compound dislocation inwards (*a*).

1099. Every complete, although simple dislocation of the *astragalus*, is of great consequence, as its *reduction* is often very difficult, frequently quite impossible, and in that case, a great degree of lameness remains; or by the stretching of the integuments a slough is formed, which only rarely remains superficial, without opening the joint, (Dupuytren), but mostly after its separation lays bare the joint, in consequence of which, severe inflammation, extensive suppuration, slough, and dangerous symptoms, are produced, and even amputation may be rendered necessary (Boyer). Only when the dislocation of the head of the *astragalus* is not complete, can the function of the foot be gradually to some extent be restored, if reduction has not been effected (Dupuytren, Boyer). In compound dislocation the danger is still greater, and depends on the kind of complication.

The impossibility of reducing dislocation of the *astragalus*, even by treatment accompanied with the greatest care and force, as observed by Boyer, Astley Cooper, Dupuytren, myself, and others, depends on the firm locking of the neck of the *astragalus* between the other bones. In the dislocation *inwards*, the neck of the *astragalus* is so locked in between the inner edge of the navicular and heel-bone, that it is completely immovcable, or when the hinder under edge of the upper-joint surface of the *astragalus* lies under the front edge of the shin-bone, as Dupuytren once observed. In dislocation *outwards*, the head of the *astragalus* may be found beneath and a little before the outer ankle, and its neck pressed on the edge of the hind-joint-surface of the heel-bone, or the head of the *astragalus* rests upon the cuboid and outer cuneiform bones; the outer edge of the upper-joint surface of the *astragalus* is placed between the first hinder-joint-surface of the heel-bone, and the shin-bone; on which account it is impossible to free the *astragalus* by the ordinary methods of reduction.

[The simple dislocation *outwards*, from the cases already mentioned, may be presumed to be irreducible.—J. F. S.]

1100. The reduction of dislocated *astragalus*, in which it must not be forgotten to diminish the contraction of the muscles, in powerful subjects, by blood-letting, *nausea*, and so on, always require bending the leg at the knee-joint. Two assistants fix the thigh, or a folded cloth is for this purpose carried round beneath the knee, and fastened to a hook behind the patient. Other two assistants fix the leg above the ankle. A folded cloth is to be applied round the heel, carried over the instep, and crossed, without covering the projecting bone, and its ends given to assistants to make extension. The extension must be made gradually and strongly, in the direction which the foot has; the surgeon places the fingers of both his hands upon the sole of the foot, and the thumbs upon the projection of the *astragalus*, which he presses back. This pressure may be practised with the flat of the hand, or whilst with the one hand he grasps the leg, and with the other the toes, he places his knee against the projecting *astragalus*, and thrusts it back (Petrunti). If the reduction be effected, the leg is to be placed half-bent, upon a

(*a*) A. Cooper, p. 364.

chaff bag, and retained by the apparatus used for fractured splint-bone, (*par.* 703), in a position contrary to the direction of the dislocation. The inflammatory symptoms are to be prevented, or got rid of, by strict rest, cold applications, and so on.

1101. If the reduction be not possible, the attempts to effect it are not to be carried too far, because thereby undoubtedly, severe inflammation, and danger of gangrene will be produced; but the *astragalus* must be laid bare by a semilunar incision, of which the convexity is directed upwards, the firmly attached parts of the ligaments divided with the knife or scissors, and the reduction then attempted; after which the wound is to be closed with sticking plaster. If the replacement be impossible, it is best to remove the *astragalus* entirely, seizing it with the fingers, or with the forceps, and separating its connexions with a bistoury or curved scissors, in which we must keep on the outside specially for the division of the interosseous ligaments. The wound is to be brought together with sticking plaster, or lightly covered with lint, and the foot and leg kept in a proper position by Sauter's or Eichheimer's apparatus. The joint-surfaces of the shin-bone are to be brought in contact with the heel-bone. The cure follows, although with shortening, yet with proper usefulness of the foot, so that the patient can gradually walk without difficulty, as I myself noticed in one case. If, after fruitless attempts at reduction, gangrenous inflammation, suppuration, and the like ensue, the removal of the *astragalus* is the only remedy, by which these dangerous unexpected symptoms may be easily got rid of, as thereby both the experience of others, as well as my own, prove the seemingly necessary amputation may be avoided.

1102. If the *astragalus* be twisted on its axis, and at the same time dislocated from its connexion with the shin-bone, the heel-bone, and navicular-bone, every attempt at reduction is actually useless, and the removal of the *astragalus* is the only way to preserve the foot.

Although many observations have been published in which extirpation of the *astragalus* has been performed with the most perfect success, when the skin had been destroyed by gangrene, or the dislocated bone had been loosened by suppuration, the early extirpation of the bone seems most proper, because thereby manifestly dangerous symptoms can be prevented. It is scarcely necessary to remember that in this extirpation the injury of the tendons, nerves, and vessels should be most carefully avoided, and every bleeding vessel tied at once.

Upon dislocations of the *astragalus* compare—

Desault, above cited, vol. i. p. 435.

Boyer, above cited, vol. iv. p. 388.

Astley Cooper, p. 376.

Rognetta, in Archives générales de Médecine, 1833, Dec., p. 485.

[Norris, in The American Journ. of the Med. Sciences, No. 40. August, 1837.—G. W. N.]

1103. The *heel-bone* may, as a consequence of a fall on the heel, or other violence, be dislocated *outwards* from its connexion with the *astragalus* and cuboid bone. The great deformity of the heel is the ground of this *diagnosis*. The bone must be pressed back into its place, and there retained by proper apparatus.

As the consequence of an old dislocation of the heel-bone which had been produced in early life by violent dragging off a boot, I have observed degeneration

like *elephantiasis* and enlargement of the leg which rendered amputation necessary (*a*).

[The two cases of dislocation outwards of this bone, mentioned by Astley Cooper, were from my notes. In the *simple* dislocation, (Martin Bentley), the tuberosity of the heel-bone had nearly disappeared, but the outside of the bone projected on the outer side of the foot much beyond the outer *malleolus*, immediately beneath which however was a remarkable depression. On the inside there was a remarkable and unnatural projection, caused by the head and inside of the *astragalus* directly below the inner *malleolus*; the whole foot was displaced outwards and the toes turned out. These appearances must have resulted from the *astragalus* having been dislocated inwards, from both heel and navicular bone, so that its under-joint surface rested on the inner edge of the heel-bone. The dislocation was easily reduced, having bent the thigh and knee on the body and fixed the leg, by laying hold of the *metatarsus* and of the tuberosity of the heel-bone, and drawing the foot gently and directly from the leg, during which extension Cline put his knee against the outside of the joint, and the foot being pressed against it, the heel and navicular bones readily slipped into their place and the deformity disappeared. In the *compound* dislocation, (Thomas Gillmore), a wound extended from opposite the middle of the base of the shin-bone, round the upper part of the instep to the outer malleolar process, exposing the head of the *astragalus* in front, and its outer under-joint-surface for the heel-bone on the outside; the latter and the navicular bone, together with the whole foot, were carried in, so that the toes pointed much inwards towards the opposite foot, whilst the tuberosity of the heel-bone projected outwards. It was reduced by extending the foot and rotating it outwards.

In Hancock's case (*b*) which seems to have been a simple dislocation of the heel and navicular bones outwards, but which was not reduced for a week, the skin which had previously vesicated, sloughed, and as the slough cleared off, the internal calcaneo-scaphoid ligament sloughed also, and the head of the *astragalus*, which had previously kept its place, twisted round on the heel-bone, till a large portion of its head protruded through the wound, and having lost its articular cartilage and become dead, about three quarters of an inch of it were sawn off, and then the wound healed. —J. F. S.]

1104. The *navicular* and *cuboid bones*, though remaining connected with the cuneiform, may be dislocated from the *astragalus* and heel-bone, which can only be effected by great violence, as the fall of a heavy weight upon the foot. The *astragalus* and heel-bone remain in their natural place, but the fore part of the foot is always twisted inwards, as in club-foot. Fixing the leg and heel, and extension of the foot outwards, effect reduction.

[A case is mentioned (*c*) of a bricklayer's boy, aged fourteen years, who fell down a height of forty feet, and apparently struck the extremity of the foot. The ligaments on the dorsal surface of the foot appear to have started, and the scaphoid and cuboid bones projected a little upwards out of their places. The foot was much swelled, was about half an inch shorter than the other, and had a clubbed appearance. Nothing was done in this case.]

1105. Dislocation *of the cuboid bone* may, as a consequence of great violence, occur *upwards*, according to Piedagnel, also *inwards* and *downwards*. The irregularity and prominence at the situation of the dislocated bone, its form, and the altered direction of the fore part of the foot, give cause for *diagnosis*, and distinguish it from a dislocation of the head of the *astragalus* upon the navicular bone; as here especially the smoothness and convexity of the head of the *astragalus* and the three joint-surfaces of the navicular bone lead to it. The leg and heel should

(*a*) Heidelb. klinische Annalen, vol. ii. p. 354.

(*b*) On dislocation of the *Astragalus* with the lower ends of the *Tibia* and *Fibula*; in Lancet, vol. ii. p. 35. 1844.

(*c*) Lancet, vol. i. 1839–40, p. 133.

be fixed, the extension of the foot made in the outward direction, and the bone pressed into place with both thumbs, after which the foot is to be laid on its side, and protected with a proper apparatus. If the reduction cannot be effected, destructive suppuration and *caries* ensue, and the extirpation of the bones is necessary (Piedagnel) (*a*).

1106. The *great cuneiform bone* may be dislocated by tearing of the ligaments which connect it with the middle cuneiform, the navicular, and the metatarsal bone of the great toe; it is then projected considerably inwards and somewhat upwards, by the action of the *m. tibialis anticus*, and does not correspond with the straight line of the metatarsal bone of the great toe. It must be attempted by pressure to return the bone to its natural place, where it is to be kept by compresses, and a bandage applied round the foot and moistened with a dispersing lotion. When the inflammation has subsided, a leathern strap should be bound around the foot, till the ligaments have united.

Astley Cooper (*b*) describes two cases of this dislocation, in both of which the bones were not replaced; there remained, however, only little detriment.

1107. Dislocation *of all the metatarsal bones* from their connexion with the first row of the instep-bones, in consequence of a fall backwards or forwards, whilst the fore part of the foot was fixed, has been observed by Dupuytren (*c*). The foot is shortened from four to eight lines by the pushing of the bones upon one another; the arching of the top of the foot is destroyed, the hinder end of the first metatarsal bone forms a projection of half an inch across, behind which is a deep hollow; the concavity of the sole is completely destroyed; the extensor tendons are to be felt distinctly, and the toes are raised by their stretching; the movements of the foot are impossible.

Reduction is effected by fixing the leg when bent, by pulling at the front of the foot with a slip knot, and by pressure on the displaced bones. The foot is then to be laid on one side, and when inflammation has ceased, it should be kept steady in a proper apparatus.

[A case of dislocation of the outer two metatarsal bones from the cuboid was admitted in 1835 at St. Thomas's, under my friend Green's care. The patient had received a violent blow by the falling of a heavy chest upon the inside of the foot. Upon the top of the foot there was a large swelling before and below the outer ankle, and behind it a cavity in which two fingers could be easily buried, in consequence of the bases of the metatarsal bones having been thrown upwards and backwards upon the top of the cuboid. At the base of the metatarsal bone of the great toe, where the blow had been received, was a swelling as large as a walnut, dependent, however, only upon effusion without displacement or fracture. The dislocated bones were reduced by continued extension with much difficulty, and as they recovered their place a distinct crackling was heard.—J. F. S.]

1108. Dislocation *of the Toes* rarely occurs, and to it applies all that has been formerly said in reference to dislocated fingers. Dislocation of the *great toe* from the corresponding metatarsal bone occurs most frequently in consequence of a fall or hanging in the stirrup. It is either incomplete with a painful projection of the lower end of the metatarsal bone, or complete with tearing of the capsule of the joint, of the tendons, of the skin and accompanied with projection of the end of the bone. Its *reduction* is performed by fixing the foot and extending the toe with

(*a*) Piedagnel; in Jour. Univers. et Hebdom., vol. ii. No. 19.

(*b*) Above cited, p. 383.

(*c*) Révue Médicale, Dec. 1822.—Heidelberg. klinische Annalen, vol. iv. pt. iv.

a slip knot. If there be also a wound, it must be properly closed with sticking plaster, and inflammation prevented especially by perfect rest, cold applications and suitable treatment. If reduction cannot be effected, the projecting end must be sawn off, and the bone kept in its proper place by a suitable apparatus. Only in splintering of the bone and great destruction of the soft parts is amputation or disarticulation of the corresponding metatarsal bone necessary. If an incomplete dislocation remain unreduced, great difficulty in walking, continued pain and inflammation of the skin, which it excites, may indicate the laying bare of the projecting end of the bone by a longitudinal cut, and its removal, in which the tendon is to be pushed aside.

Astley Cooper (*a*) observed an old simultaneous dislocation of the four lesser toes from their connexion with the corresponding metatarsal bones, by which the functions of the foot were in a great degree destroyed.

(*a*) Above cited p. 385.

SECOND DIVISION.

(CONTINUED.)

III.—SOLUTION OF CONTINUITY FROM ALTERED POSITION OF PARTS.

(CONTINUED.)

B.—OF RUPTURES.

1109. *A Rupture* (*Hernia*. Lat.; *Bruch*, Germ.; *Hernie*, Fr.) is the protrusion of an intestine from its own cavity into the surrounding cellular tissue, or into another cavity. Ruptures are therefore distinguished, according to the three cavities of our body, as *ruptures of the belly*, *of the chest*, and *of the head*.

I.—Of Ruptures of the Belly.

First Chapter.—OF RUPTURES OF THE BELLY IN GENERAL.

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1110. Ruptures of the Belly (*Herniæ abdominales*) may occur throughout the whole extent of its wall, if this give way or be torn. Most com-

monly they occur at those parts of the belly where there are already openings for the passage of vessels, nerves, and so on.

1111. According to the various parts at which ruptures are formed, they are distinguished as, 1, *Inguinal*, which pass through the inguinal canal, 2, *Femoral*, beneath POUPART's ligament; 3, *Umbilical*, through the umbilical hole; 4, *Thyroid*, through the thyroid hole; 5, *Ischiatic*, through the ischiatic notch; 6, *Ventral*, through the wall of the belly, the holes already mentioned excepted; 7, *Perinæal;* 8, *Vaginal;* 9, *Rectal*, when the rupture protrudes at the *perinæum*, in the *vagina*, or in the *rectum* (1).

Inguinal, femoral and umbilical are the most common ruptures, the others are more rare.

[(1) To this list must certainly be added *Phrenic* rupture (*Hernia diaphragmatica.*) And English surgeons speak also of *mesenteric*, *meso-colic*, and *meso-rectal* ruptures, although strictly speaking they do not resemble true ruptures in leaving their proper cavity, but they burst through parts which have no natural opening for their passage and thus become displaced.—J. F. S.]

1112. Those intestines of the belly which on account of their position and connexion are least fixed, protrude most commonly, as the *omentum* and the small intestines, more rarely the large intestines, the stomach, the bladder, the internal female generative organs, and the like. Parts may be in the rupture which in their natural place are very far from it. These are either drawn down by the protruding intestines, with which they are connected; or by the descent of the *peritoneum* to which they are attached. According to the intestine which ruptures contain are they distinguished as *intestinal*, (*Hernia Intestinalis*, Lat.; *Darmbruch*, Germ.; *Enterocèle*, Fr.,) *omental*, (*Hernia Omentalis*, Lat.; *Netzbruch*, Germ.; *Epiplocèle*, Fr.,) *ventricular*, (*Hernia Ventriculi*, Lat.; *Magenbruch*, Germ.; *Gastrocèle*, Fr.,) *vesical*, (*Hernia Vesicæ*, Lat.; *Harnblasenbruch*, Germ.; *Cystocèle*, Fr.,) and so on. Several intestines may be contained at the same time in one sac, as for instance intestine and *omentum*, (*Darmnetzbruch*, Germ.; *Entero-epiplocèle*, Fr.,) and the like.

1113. When the intestines of the belly are protruded into a rupture, they are usually enclosed in a sac, (*saccus herniosus*, Lat.; *Bruchsack*, Germ.; *sac herniaire*, Fr.,) which is formed of the lengthened *peritoneum*. In rare cases only is this sac deficient; for instance when the rupture is caused by great violence, or after previous wound of the wall of the belly, or after the application of escharotics for the radical cure of the rupture. The sac may also be torn, or destroyed by absorption. If intestines protrude, which are not enclosed in the *peritoneum*, for example, the bladder (1) and *cæcum* (2), there is not any sac; but if they be much protruded, they draw down the *peritoneum* connected with them, and thereby form a sac into which other intestines may pass.

[(1) In regard to vesical rupture, it is certainly just possible that the bladder may rise to the internal abdominal ring, and thrusting up the *peritoneum* from that opening, may protrude some part of its body uncovered by *peritoneum* through it, and this may continue to descend through the inguinal canal and form a rupture without a peritoneal or true hernial sac. But such state of things is highly improbable, and in the two cases of vesical rupture in the museum at St. Thomas's is certainly not so, for in this preparation it is the *fundus* of the bladder, that part of the organ most likely to be protruded, with its peritoneal covering which has passed

through the abdominal ring into a distinct peritoneal sac, which from its appearance probably belonged originally to a rupture of the intestinal or omental kind.

(2) I do not think that the *cæcum* would often protrude as a rupture without having a peritoneal sac, more than the bladder, and for nearly the same reasons. There is, however, in the Museum at St. Bartholomew's a *cæcum* carried into the *scrotum* with a partial sac, and I have also had one case in which I suspect the *colon* did. But that it does descend into a true hernial sac is beyond doubt, for in the museum of the Royal College of surgeons of England, there is an instance of the lower end of the *ileum*, the *cæcum* and its appendage, and part of the ascending *colon*, with a large piece of *omentum* in the sac of a large oblique inguinal rupture. There is also another preparation, in which the lower end of the *ileum*, with the *cæcum* and its appendage, are in the sac of an inguinal rupture, and the extremity of the appendage is attached to the bottom of the sac. In St. Bartholomew's museum there is a scrotal rupture (with hydrocele in front) containing *cæcum* and *colon*. Also a femoral rupture, in which there is small intestine, a portion of the sigmoid flexure of the *colon* and *omentum*.

A very rare instance of protrusion of the vermiform appendage of the *cæcum* in a strangulated inguinal rupture is given by Taramelli (*a*); the appendage alone was found in the sac, increased to four times its ordinary size, and an indent at its junction with the *cæcum* showed the seat of strangulation. The patient did well.—J. F. S.]

1114. The cavity of the hernial sac is connected with the cavity of the belly by an opening, the *mouth of the sac;* the narrow part between this opening and the greater extent of the sac is called the *neck of the sac;* the remaining part the *body;* and the blind end the *bottom* of the hernial sac. The sac is furnished with different coverings according to the difference of place where the rupture exists; on its outer surface it is slightly connected with the surrounding cellular tissue, and therefore the sac remains external when the intestines have been returned.

1115. The hernial sac is very frequently subject to changes. The *peritoneum* of which it is formed usually retains its natural condition, and when in old ruptures it thickens, and is found to consist of several layers, the cause of these changes, for the most part, rests on the thickening of the cellular tissue, which covers the outer surface of the sac. The substance of the *peritoneum* itself, however, often thickens and even becomes almost cartilaginized (1). These changes are the result of the irritation and pressure to which the sac is subjected, by the passage forwards and backwards of the intestines; they therefore occur especially in old ruptures which cannot be properly kept up by the truss, and mostly at the neck of the sac. If by contraction of the neck of the sac, or by thickening of the cellular tissue covering it, a narrowing be produced, it may in the gradual increasing volume of the rupture descend, and thus may several strictures be formed in the body of the sac (2). These changes are not always relative to the size of the sac. In large ruptures the sac is often very thin, even so thin, that the peristaltic movement of the intestines can be perceived through the external skin. In large umbilical ruptures the hernial sac is often very thin, and in small femoral ruptures very thick. Swellings also may form on the sac from degeneration of the cellular tissue (3).

[(1) In the museum at St. Thomas's there is a preparation of a femoral hernial sac converted into bone.

(2) I do not agree with Chelius's statement on the causes of stricture in the body of the hernial sac. As regards the descent of the neck, or more properly, the mouth

(*a*) Omedei, Annali Universali di Medicina, vol. lxxv. p. 430. 1835.

of the sac, into its cavity, so that the stricture is not at the immediate opening into the cavity of the belly, but at a less or greater distance below it, so far as I have had opportunity of observing, it is of great rarity. I have only once seen it, and that during last spring, in a case of oblique scrotal rupture, in a young man, which had existed for several years, and in which during the operation an extremely tight stricture was found very high up. This I divided upon a director sufficiently to admit my fore-finger freely into the cavity of the belly; but with all the pains I could take I was unable to return the gut. After many unavailing efforts I cut through the tendon of the external oblique muscle and the other coverings of the upper part of the sac, till I brought its strictured mouth completely into view, which immediately explained the difficulty. The mouth of the sac had descended into its cavity, doubling the neck upon itself, so that a circular blind pouch about half an inch deep, encircled the mouth, which had the same relation to the sac as the mouth of the womb has to the *vagina*, and its margin had become so firmly and narrowly thickened, that it resembled a ring of whipcord. Into this blind circular pouch the intestine had been thrust at every attempt I had made for its reduction, and thus both escaped, and shut up the mouth of the sac. The finger could be passed into the cavity of the belly, as freely as before; but I thought it best to divide this cord-like edge and the indoubled neck, so as to render the reduction more easy, and such was the result. The patient did well.

As to the production of strictures in the body of the sac, I believe that generally these depend much more frequently on bands of adhesive matter having been thrown out under inflammation of the peritoneal sac itself, from some accidental cause or other, rather than from thickening of the cellular tissue external to it, which, however, may take place, as I have seen it do, occasionally producing, not indeed actual bands or strictures, but merely an hour-glass contraction of the sac.

(3) Sometimes a hernial sac is contracted in its middle and assumes an hour-glass shape; such a case I have operated on, but it did not produce any confusion. Occasionally, however, it may, as is shown in a preparation at St. Bartholomew's, in which the sac of a congenital rupture has an hour-glass contraction at the abdominal ring, and part of it is without, whilst the other part is within the belly, and into the latter portion the gut had been returned, and left.—J. F. S.]

1116. The size of ruptures is very different. Often the rupture contains the greatest part of the intestines of the belly; often is it so small that it can be discovered only with the greatest care. Of the intestine itself there is protruded either an entire loop or only a portion.

1117. Several ruptures often occur in the same subject. Rarely are several, each having its own sac, at the same spot; more frequently, by the protrusion of the urinary bladder, or some other intestine only partially covered with *peritoneum*, so that the latter is drawn with it, a hernial sac is formed into which the intestines pass. A double hernial sac is very rare, and indeed possible only in inguinal hernia, where a special sac containing intestines may drive into the vaginal tunic of the testicle, when its mouth has remained open.

Bransby Cooper (*a*) mentions a case of two inguinal ruptures on the same side; the contents of the hinder, larger sac, which remained external, were returnable into the cavity of the belly, but the front smaller sac with its contained intestine had been easily returned into the belly, by the *taxis*; he does not, however, explain, how it happened that this thrusting up of the sac and its contents had been effected which is one of the most curious points of the case.

[Lawrence says, there is a "kind of double rupture not ascertainable in general, except by examination after death, or in operating, viz:—two sacs passing through the same opening; this may happen in external or internal inguinal or crural *herniæ*. There are instances of even three sacs, particularly in inguinal *herniæ*." (p. 13).

As regards the number of hernial sacs, Astley Cooper says:—"Two herniary

(*a*) Guy's Hospital Reports, vol. iv. p. 326.

sacs have been stated to pass behind the same crural arch; but although I would not be understood to deny their existence, I have not seen an example of sacs having two separate orifices into the cavity of the *abdomen;* but I have known one hernial sac descending into the sheath for the crural vessels, and crossing the anterior part of these, and another portion of it quitting the sheath and extending in the usual direction upon the thigh." (p. 4). He also gives an example of six hernial sacs:— "Two of the sacs upon each side were placed between the umbilical and epigastric arteries; and one on each side is situated between the remains of the umbilical arteries and the *pubes*. They passed between the tendinous fibres of the *transversalis*, which they had separated, and entered the abdominal rings, after which they were covered, as usual, by the *fascia*, which is extended from the external oblique muscle over the spermatic cord." (Explanation of pl. x. pt. i). And he observes, that after wearing a truss, "although the original sac may be completely shut at its mouth by adhesion or perfect contraction, it is possible that another sac may be formed contiguous to the first." And he gives an instance, in which "two hernial sacs were found side by side, one open and capable of containing the bowels when protruded, the other contracted so much as not to admit a goose's quill." (p. 23).

Morgan (*a*) had a remarkable instance of a pouch formed at the mouth of the *tunica vaginalis*, in consequence of partial adhesions of the membrane. The patient had scrotal rupture on the right side, accompanied with symptoms of strangulation. It was reduced with great ease, by gentle application of the *taxis*. The symptoms, however, continued, and on the following day "a small tumour was perceptible in the course of the inguinal canal." On the third day he was worse, and an operation having been decided on, "after dividing the integuments, superficial *fascia*, and cremaster, in the usual manner, what appeared to be hernial sac was brought into view; this was laid open, and on the operator introducing his finger, it readily passed through the external ring into the inguinal canal; here an unnatural projection could be felt, but no gut was found, nor could the finger be passed into the *abdomen*. The inguinal canal was then exposed by slitting up the tendon of the external oblique, and the sac before mentioned was more extensively opened, still no intestine could be found, and no communication appeared to exist between the sac and the abdominal cavity. A substance was felt in the canal which resembled a thickening of the cord." Nothing more was done, and he died on the second day after the operation. Upon examination, the part "supposed to be hernial sac, and opened as such was the reflected portion of the *tunica vaginalis*, into the cavity of which the finger had been introduced." The tumour in the course of the inguinal canal was a hernial sac, behind the cord, and containing a portion of strangulated intestine of a very dark colour, and with a large gangrenous spot. This *hernia*, had by its pressure, prevented the entrance of the finger into the belly. "Just below the opening of the *tunica vaginalis* into the *abdomen*, was situated the mouth of a preternatural pouch, which extended downwards and inwards behind the *fascia transversalis* in the direction of the crural ring. It was into this pouch that a portion of the *ilium* had descended and had there become strangulated. It seems probable that at the time of the man's admission into the hospital, a large portion of intestine had descended into the cavity of the *tunica vaginalis*, the cavity of which bore all the appearances of an old hernial sac. This, however, was easily returned, while the portion of bowel contained in the other pouch, remained unreduced and suffering under strangulation, caused the symptoms which ended in the patient's death." (p. 83).

In the museum at St. Bartholomew's there are two beautiful preparations, one exhibiting two inguinal hernial sacs, on the left side, close together and of considerable length, the mouth of the outer very small; the other femoral, in which there are two distinct sacs and orifices, the outer descends beneath the semi-lunar edge of the *fascia lata*, but the inner is so small that it scarcely protrudes.

Sometimes the sac of a rupture is divided vertically into two, probably by adhesive inflammation. I have operated on one such scrotal case. In St. Bartholomew's museum there is a common scrotal and also a congenital scrotal rupture of similar kind.

In rare cases, one or other side of the sac of a femoral rupture is burst, and a part

(*a*) Astley Cooper, above cited, p. 83.

of its contents are protruded in either direction, so as to form a seeming second sac. I have had three cases of this kind, which will be hereafter noticed, and the case mentioned by ASTLEY COOPER, in which "one hernial sac descended into the sheath for the crural vessels and crossed the anterior part of these, and another portion of it quitted the sheath and extended in the usual direction upon the thigh," (p. 4), I believe to be of similar kind. Neither of these, however, are to be confused with the case described and figured by BRANSBY COOPER.—J. F. S.]

1118. Ruptures are either *free*, or *reducible*, (*frei*, *beweglich*, Germ.; *mobile*, Fr.,) when they return of themselves, or can be returned by moderate pressure; or *irreducible*, (*unbeweglich* Germ.; *immobile*, Fr.,) when their return is impossible, the cause of which lies in the *adhesion of the intestines together* or *to the hernial sac*, in the *strangulation* or *other change of the parts found in the rupture.*

1119. As regards their origin, ruptures may be divided into *original* (*Herniæ congenitæ*, Lat.; *angeborne Bruch*, Germ; *Hernie congénitale*, Fr.) and *acquired*, (*Herniæ acquisitæ*, Lat.; *erworbene Bruch*, Germ; *Hernie acquise*, Fr.); in the first case the intestines pass through the processes of the *peritoneum*, which remain open; in the second, after the processes have closed or at some other place.

1120. The *causes* of abdominal ruptures are *predisposing* and *occasional.* Predisposition to rupture, which may be either original or acquired, consists in a relaxation and weakness of the wall of the belly, and in greater enlargement of its natural openings. It may be produced by corpulency, by great extension of the wall of the belly during dropsy or pregnancy, by quick emaciation, by scars after wounds, especially, when the injury of the abdominal wall has been connected with bruising; by diseased changes of the intestines of the belly, by loading them with coarse food, by immoderate use of relaxing drinks and the like.

The occasional causes are all kinds of violence which produce great contraction of the wall of the belly and depression of the diaphragm, whereby the intestines are forcibly thrust against the former; for instance, a violent thrust or blow upon the belly, tight lacing, violent exertion on lifting heavy weights, in breathing, coughing, vomiting, in childbirth, peculiar positions, and so on. The greater the predisposing causes to rupture, the less requisite are the occasional causes; in great disposition to rupture, they often occur without any assignable occasional cause.

In many countries ruptures are very common, and their causes seem to depend on climate, on the mode of living, and on the particular exertions to which the inhabitants are subjected.

Ruptures occur more frequently in men than in women, and more frequently on the right than on the left side (1).

[(1) LAWRENCE has given the following curious statistical account of ruptures:—"The comparative number of the different kinds of ruptures, and the relative frequency of the complaint generally, as well as that of its various forms in the two sexes, and at different periods of life, are exhibited in the following statement, extracted from the register of the patients relieved by the City of London Truss Society within twenty-eight years:—

In 83,584 patients, 67,798 were males, and 15,786 were females.

Males.	Females.			
14006	511 left inguinal	39419 inguinal	. .	45629 single
24316	586 right inguinal			
278	2255 left femoral	6210 femoral		
421	3256 right femoral			

24966	286	double inguinal	27029 double
169	1608	double femoral	
664	2775	umbilical	4063
209	415	ventral	
1	3	peritoneal	4
1	4	obturator	5
26	46	have undergone operations	72
2289	1401	with umbilical and inguinal hernia have been cured	3690
446	243	with prolapsus ani	689
	2196	with prolapsus uteri	
	37	with prolapsus vaginæ	2392
	159	with prolapsus vesicæ	
6	5	with varix of the abdominal veins	11
67798	15786—83584		83584

In addition to the above statement, the following varieties in the situation of this malady have been noticed, viz. in

799 Males.

184 left inguinal and right femoral hernia,
82 left inguinal and left femoral hernia,
13 left inguinal and double femoral hernia,
10 left inguinal and ventral hernia,
13 left inguinal and umbilical hernia,
3 left inguinal hernia and prolapsus ani,
3 left inguinal, umbilical, and ventral hernia,
135 right inguinal and left femoral hernia,
27 right inguinal and right femoral hernia,
25 right inguinal and double femoral hernia,
16 right inguinal and ventral hernia,
26 right inguinal and umbilical hernia,
7 right inguinal hernia and prolapsus ani,
1 right inguinal, umbilical, and ventral hernia,
87 double inguinal and right femoral hernia,
54 double inguinal and left femoral hernia,
27 double inguinal and double femoral hernia,
1 double inguinal and double femoral hernia outside of the femoral vessels,
12 double inguinal and ventral hernia,
1 double inguinal aud double ventral hernia,
48 double inguinal and umbilical hernia,
18 double inguinal hernia and prolapsus ani,
2 double inguinal, umbilical, and ventral hernia,
1 left femoral and umbilical hernia,
1 right femoral and ventral hernia,
1 right femoral and umbilical hernia,
1 right femoral hernia outside of the femoral vessels,

799

366 Females.

13 left inguinal and left femoral hernia,
40 left inguinal and right femoral hernia,
1 left inguinal and double femoral hernia,
2 left inguinal and umbilical hernia,
6 left inguinal hernia and prolapsus uteri,
1 left inguinal hernia and prolapsus ani,
20 right inguinal and left femoral hernia,
5 right inguinal and right femoral hernia,
1 right inguinal and double femoral hernia,

Carried forward 89

Brought forward	89
9	right inguinal and umbilical hernia,
3	right inguinal and ventral hernia,
3	right inguinal hernia and prolapsus uteri,
1	double inguinal and right femoral hernia,
8	double inguinal and umbilical hernia,
5	double inguinal and ventral hernia,
1	double inguinal hernia and prolapsus uteri,
28	single femoral and umbilical hernia,
10	single femoral and ventral hernia,
1	left femoral and double ventral hernia on the right side,
1	left femoral and right obturator hernia,
3	left femoral hernia on the outside of the femoral vessels,
14	single femoral hernia and prolapsus uteri,
2	right femoral hernia on the outside of the femoral vessels,
1	right femoral hernia on the inside and outside of the femoral vessels,
2	right femoral hernia, prolapsus uteri, and prolapsus vesicæ,
12	double femoral and umbilical hernia,
3	double femoral and large ventral hernia,
8	double femoral hernia and prolapsus uteri,
2	double femoral hernia and prolapsus ani,
22	umbilical and ventral hernia,
5	umbilical hernia and prolapsus uteri,
1	umbilical hernia, prolapsus uteri, and prolapsus vesicæ,
1	ventral hernia and prolapsus uteri,
5	prolapsus uteri and prolapsus ani,
109	prolapsus uteri and prolapsus vesicæ,
8	prolapsus uteri and prolapsus vaginæ,
10	prolapsus uteri, prolapsus vesicæ, and prolapsus vaginæ
366	

" 5448 patients had congenital hernia

7299	patients were relieved with trusses under ten years of age.
4551	between 10 and 20
8715	20 — 30
13614	30 — 40
15627	40 — 50
14169	50 — 60
9761	60 — 70
3866	70 — 80
442	80 — 90
23	90 —100
78067	

"Of 457 herniæ examined by M. Cloquet, 307 occurred in the male, 150 in the female sex; 246 on the right, 187 on the left side, and 24 on the middle line of the abdomen.

"The numbers of the different kinds were as follows:—

Males.	Females.			
94	11	right external inguinal	203 external,	289 inguinal.
79	19	left		
39	8	right internal	86 internal.	
35	4	left		
33	54	right femoral		134 crural.
22	25	left		
3	21	umbilical and linea alba		24.
2	5	right obturator		10 obturator.
0	3	left		

Recherches sur les Causes et l'Anatomie des Hernies abdominales, p. 9, note."]

1121. The following are generally the *symptoms of a reducible rupture*

of the belly,—a swelling of quick or gradual production, not painful, elastic, of different form according to the opening by which it protrudes, on the surface of which the skin is unchanged, which can be returned by sufficient pressure, which returns of itself when the patient lies on his back, but after any exertion in coughing, sneezing and the like, also after meal-time again protrudes or enlarges. It is accompanied with symptoms of disturbed intestinal functions, as sluggish bowels, rumblings in the bowels, belchings, disposition to vomit, dragging pains in the belly, and the like, which symptoms subside if the swelling be reduced, and afterwards the bowels are usually relieved.

If the rupture be small and deeply situated, the *diagnosis* is often difficult, and must be determined by close examination, by consideration of the origin of the swelling, and by all the existing symptoms.

1122. Decision as to the parts contained in the rupture is often very difficult, often even impossible, on account of the different changes which the parts themselves and the coverings of the rupture undergo.

[Chelius's observation, in reference to the difficulty or impossibility of distinguishing intestinal from omental rupture, is most fully borne out by practical experience, so that few persons are so hardy as to prognosticate the contents of a rupture-sac till it is opened.—J. F. S.]

1123. The *intestinal rupture* is characterized by a swelling more regular on its surface, elastic, which enlarges when the intestine is loaded, and in returning affords a gurgling noise (1), often felt in the swelling by the patient himself, and by the simultaneous symptoms of stoppage of the passage of the stools.

[(1) This gurgling noise is often entirely independent, I believe, of intestine, and caused by the quantity of fluid contained in the sac. And from the same cause arises a symptom which often puzzles a young surgeon; to wit, the seeming reduction of a large portion of the contents of the sac, with a gurgling noise, whilst the remaining contents cannot be returned; and on the removal of the fingers, the rupture reacquires its original size, but admits of the same diminution, by pressure, only again to recover its bulk when the efforts at reduction are given up. This is very easily explained, as the fluid contained in the sac being pressed, squeezes between the sac and its contents into the cavity of the belly, although the intestine or *omentum* is so firmly grasped by the stricture that it cannot be returned.—J. F. S.]

1124. The *omental rupture* feels doughy, irregular, often rope-like, has a more cylindrical form with a broader base, is more slowly developed, is more difficult to reduce, is unaccompanied with any gurgling, and produces a heavy dragging upon the stomach.

1125. *Vesical rupture* is distinguished by the swelling fluctuating, enlarging, and becoming tense, if the patient retain his urine, and diminishing when he discharges it; and by pressure on the swelling exciting a disposition to void the urine. Frequently after making water, the tumour does not diminish, but the patient does not feel any disposition to urine, when it is pressed. As the bladder is always more or less dragged or pulled, the patient has a frequent disposition to make water; frequently the urine is completely retained, and in introducing a catheter, it must be observed that it be conducted in a peculiar manner into the bladder. If the vesical be complicated with omental or intestinal rupture, the symptoms are confused. Not unfrequently a stone is formed in the protruded part of the bladder.

1126. As to the other intestines which may be in the rupture, *the position of the rupture*, *its condition*, and the *disturbed functions of the*

contained parts, afford the key. If several parts be together in the rupture, these symptoms are confused.

1127. Ruptures are always extremely important diseases. If they be left alone, and their neighbourhood be undisturbed, they always increase; the local and general inconveniences become greater, and the intestines may descend in such quantity into the rupture, that the greater part of them may rest in it. By the changes produced in the hernial sac (*par.* 1115) and the contained parts, the return of the rupture is rendered impossible, or strangulation is produced.

1128. The intestines contained in the rupture, may, in consequence of previous irritation, adhere to each other, or with the hernial sac, and the adhesion may be either a mere sticking together with a gelatinous mass, or it may be fibroid, or of a fleshy character, and may take place often only at certain parts, often to a great extent, so that all the parts of the rupture are consolidated into one mass. Omental ruptures grow together more readily than intestinal.

The adhesion of the hernial sac with the intestine, must be distinguished from those adhesions with the sac, which have existed before the production of the rupture, between the *peritoneum* and the intestines, in which the parts lying in the rupture, are, in the same way, attached to the sac, as it was earlier in the belly.

1129. The portion of intestine lying in the rupture, is generally thickened, and often considerably narrowed (1). This thickening of the tunics of the intestine may depend on the great development of their muscular coat, consequent on violent straining, for the purpose of driving forward its contents, in the obstructed return of the blood, or in the deposit of fibrine.

The *omentum* is very frequently very much changed in reference to its structure and form; it is usually thick and hard at the neck of the sac; often rope-like, often rolled up into a hard lump; often is its bulk very much increased, beset with growths, and often exceedingly hardened.

[(1) I do not think that the protruded intestine is often either thickened or narrowed. The thickening which is sometimes observed in a strangulated gut, is of two kinds. The less important is when in consequence of strangulation, serum only is effused into the cellular tissue connecting the intestinal coats without other alteration, speedily subsides on the division of the stricture, and is not to be feared. The other kind, in which the cellular tissue of the gut is filled with adhesive matter, the result of a slow inflammatory action, and the intestinal wall acquires a thickness of the eighth of an inch or more, does not subside when the strangulation is removed, has a doughy feel, and is of a dirty reddish white colour, is a very dangerous symptom of the disease, and leads to the anticipation of an unfavourable termination of the case.—J. F. S.]

1130. When by a disproportion between the parts contained in the rupture, and the parts containing them, the communication between the belly and the rupture is arrested, *strangulation* (*Strangulatio*, Lat.; *Einklemmung*, Germ; *Etranglement*, Fr.) ensues. The *causes* producing this disproportion are, increased protrusion of the intestine in any exertion, overfilling of the intestine in the rupture with stools, intestinal gas, foreign bodies, and the like, consequent on overloading the stomach with food difficult of digestion and flatulent; growth of the protruded intestine, inflammatory swelling, degeneration of the *omentum*, and spasmodic affection of the intestinal canal.

1131. The seat of strangulation is either in the *opening into the belly*,

through which the rupture has been produced (the *mouth of the rupture, Bruchpforte*, Germ.) or in the *hernial sac itself.*

1132. The *aponeurotic parts,* which form the abdominal mouth of the rupture, produce the strangulation of the parts protruded in great quantity, or increased in volume, never by *active* contraction, but because they do not yield any more, and by means of their elasticity, endeavour to return to their natural condition. Only in (external or oblique) inguinal ruptures, does a narrowing of the mouth of the rupture, by contraction of the wall of the belly, where the fibres of the internal oblique and transverse muscles surround the neck of the sac, seem possible to be produced.

1133. In the *hernial sac,* the confining part is either at the neck, or at various parts of its body, by narrowing and strictures which form in it, (*par.* 1115,) or it tears, and the intestines escaping through this opening become strangulated.

1134. The determination of the seat of the strangulation is often difficult, often impossible. The following circumstances may direct the practitioner:

Firstly. In a rupture which quickly arises from severe violence, or where, with little extensibility of the opening by which it has escaped, a large quantity of intestine is suddenly protruded, the unyieldingness of this opening is, for the most part, the cause of the strangulation. The hernial swelling does not spread upwards above the external abdominal ring, in inguinal rupture, the inguinal canal is throughout its whole extent yielding and free from pain; the pillars of the outer ring are stretched (*a*).

Secondly. That the strangulation is at the neck of the sac, as is most frequently the case, at least in inguinal ruptures, may probably be supposed, in ruptures which having been long kept up by a truss, suddenly protrude; when the aperture through which the rupture protrudes, not stretching, the hernial swelling, although very tense, is reducible, and in the attempt to return it behind the abdominal ring, a swelling is formed. The inguinal canal is full, hard, tense, painful, and presents to the feel a cylindrical swelling.

Thirdly. Tearing of the hernial sac, or the inflammatory affection of the parts lying in the rupture, may be supposed to be causes of the strangulation, from the violence with which they operate upon the rupture itself; and in tearing the hernial sac, by the changes in its form which the hernial swelling undergoes from the projecting of the intestines into the opening of the sac (*b*).

Fourthly. The overfilling of the intestines with intestinal matter, causes strangulation, mostly slowly, in old ruptures, by its gradual collection, or by overfilling the stomach. According to Malgaigne, never does solid matter, but only intestinal gas collect; the true ground of strangulation is inflammation, which is consequent on such ruptures.

Fifthly. The growth of the intestine itself, and the strangulation resulting therefrom, cannot be ascertained previous to operation.

Malgaigne's supposition, that the strangulation is not produced by the ring, but at the neck of the sac, is too general; it is also opposed by Diday (*c*).

(*a*) Dupuytren, De l'Etranglement au collect du sac herniaire; in his Leçons orales de Clinique Chirurgicale, vol. i. p. 557.

(*b*) Breidenbach, Ueber Einklemmung durch Zerreisung des Bruchsaches; in Heidelberg klinischen Annalen, vol. ii. pt. 1.

(*c*) Gazette Médicale de Paris. 1841. No. 19.

1135. According to the degree of disproportion between the containing and contained parts of the rupture, is the severity of the symptoms thereon depending. Therefore either merely the communication between the rupture and the cavity of the belly is stopped, (*Incarceration; Incarceratio Herniæ*, Lat.; *Einsperrung*, Germ.,) or the protruded parts are at the same time so compressed, that the circulation of the blood and other juices is prevented (*Strangulation, Strangulatio Herniæ*, Lat.; *Einklemmung*, Germ.) In the latter case, the symptoms are dependent on the arrested passage of the intestinal matter, and on inflammation; they become very active, on which account, this kind of strangulation is called *inflammatory* or *acute*. In the former case, at least at the onset, the symptoms depend only on the arrested passage of the stools, they are little severe, and may continue longer, wherefore this kind of strangulation is distinguished as *chronic;* but it runs earlier or later into inflammatory strangulation, if the disproportion proceed to the above-mentioned extent. It is usually connected with *long-continued overloading* of the intestine, lying in the rupture, with stools, or with spasmodic affection of the walls of the belly and intestines, in consequence of spasmodic, flatulent or bilious colic, by which the intestines are immoveably retained in the rupture (*Spasmodic Incarceration.*)

Opinions are very various as to the nature of strangulation and the classification thereon grounded. Many assume that strangulation is always, as regards its nature, the same, that is, always *inflammatory*, and that no actual difference in its form occurs, but that it is only acute or chronic according to the degree and severity of the strangulation and the circumstances attending it (Scarpa, Lawrence, Travers, Boyer, Von Walther, Jaeger, and others). Some take in its widest acceptation the divison, proposed by Richter into inflammatory, spasmodic, and that caused by collection of stools, (Langenbeck, Wilhelm, Blasius, and others), and differ only in their description of the symptoms, as they hold them, some as consequent on contraction of the abdominal muscles, especially of the front wall of the inguinal canal, (Langenbeck), some as a consequence of the contraction of the internal muscular inguinal ring, (A. Cooper), and some as resulting from the spasmodic motion and contraction of the tendinous parts, arising from every trifling irritation (Wilhelm). Rust assumes, in referenee to the seat of strangulation, a division *active* and *passsive*, according as the parts forming the opening of the rupture contract, and grasp the protruded parts, or according to their morbid condition, and he assumes according to the causal relations of the strangulation, an inflammatory, spasmodic, organic (from the stricture of the hernial sac, loops of *omentum* or intestine, adhesions, and the like) and fæculent division. Sinogovitz (*a*) considers strangulation as varying only in degree, according as by it the communication is completely cut off or only rendered difficult to a greater or less extent; all the other statements applied to strangulation were only from sympathy of the alimentary canal, namely, from local hindrance of the circulation of the blood and contents of the intestine. This view was already taken by Seiler, and arranged according to this division under imperfect and perfect strangulation and incarceration, and also according to the symptoms, without inflammation, with collection of excrement, with spasm, and with inflammation (*b*).

From these various opinions may be observed, that the views above mentioned differ from each other chiefly in relation to spasmodic strangulation; that in the manner presumed by many, an active spontaneous contraction of the opening into the belly should take place, is just as untenable as the notion of an active strangulation in general; since a spontaneous contraction of the abdominal ring cannot be admitted, external or oblique inguinal rupture, perhaps, excepted, where the muscular fibres forming the internal ring may, as A. Cooper himself admits, contract.

(*a*) Anleitung zu einer zweckmässigen Manual-hülfe bei eingeklemmten Leisten und Schenkel-brüchen. Danzig, 1830.

(*b*) Rust's Handb. der Chirurgie,—Art, *Hernia.*

The spasmodic affection in ruptures must be sought not in the containing parts, but in the contents of the rupture; and as the inflammation, although not the cause, is usually a consequence of the strangulation, so must the spasm be considered as an important symptom accompanying the strangulation, by getting rid of which we may hope to be enabled to fulfil the principal indication, namely, to return the protruded intestine or to diminish the relatively too great bulk of the protruded parts. (SEILER).

[The common and indiscriminate use of the terms strangulation and incarceration is very incorrect, for many ruptures are incarcerated which are not strangulated. An *incarcerated* rupture properly speaking is that kind of the disease, in which the protruded *omentum* or intestine, from some cause or other, cannot return or be returned into the belly, but does not produce any symptoms of disturbed intestinal functions. This is of very common occurrence, particularly in old and large ruptures, in which the only inconvenience is the bulkiness of the swelling. A *strangulated* rupture is on the contrary a most serious and quickly fatal disease. The protruded *omentum* sometimes tying down or compressing between itself and the hind wall of the belly, a portion or portions of the intestines still within the cavity of the belly, so as to prevent the passage of their contents, and thus causing vomiting and constipation; or a piece of intestine which has descended into the sac, is so girt by its neck, that the contents cannot pass through it, and even its mortification may ensue by the tightness of the neck of the sac preventing the flow of blood through it. These observations prove the marked distinction between incarceration and strangulation. It must, however, be remembered that every strangulated rupture is incarcerated till the stricture be removed, and it be rendered returnable; but the relief of the stricture does not necessarily get rid of the incarceration, as there may be other causes, as adhesions or size of the protruded part, which prevent its return. Therefore every strangulated rupture is incarcerated, and a rupture may be strangulated and incarcerated, or it may be simply incarcerated or incapable of return without producing any symptoms.—J. F. S.]

1136. The symptoms of *acute strangulation* which usually set in after the sudden protrusion of a considerable quantity of intestine, or in a suddenly produced rupture after violent exertion and the like, or in those which have been long kept up by a truss, are, more severe pain in the hernial swelling and a sensation, as if a cord were tied round the belly; the rupture is tense, elastic, and cannot be returned; belchings and vomiting of the contents of the stomach, subsequently, of bile, and at last, of fluid stool and part of the clysters; the vomiting becomes more or less frequent, either of itself, or after the use of every, even of the mildest drink; the pulse, at first, quick and hard, subsequently becomes small and contracted; the belly is tense and tender, as is also the hernial swelling, and the skin covering it is frequently reddened; from the first there is obstinate costiveness, but when there are excrements in the large intestines, they can be emptied by clysters (1). In small ruptures which contain only one wall of the intestine, LITTRE's (*a*) or *lateral rupture*,) the costiveness may be deficient or imperfect. If no assistance be afforded, the uneasiness, anxiety, tension and painfulness of the belly and of the rupture increase, the vomiting becomes more frequent and painful, the body is covered with sweat, the pulse, quick, small, and thready, becomes irregular, the patient's countenance sinks in. Exacerbations and remissions of these symptoms, however, present themselves, and deceive both the patient and the practitioner.

[(1) Although costiveness is generally one of the symptoms of strangulation, it is by no means uncommon for the bowels to be relieved, and not unsparingly, al-

(*a*) LITTRE; in Mémoirs de l'Académie des Sciences. 1700. RIECHE, C. F., Ueber Darm-Anhangsbrüche (*Herniæ Litterica*) mit Bemerkungen über Kothfisteln u. widernaturlichen After. Berlin, 1841; with one copper plate.

though the strangulated bowel be impervious. This depends on the part of the intestinal canal strangulated; and the quantity of stool remaining in it below the protruded part.

I have on more than one occasion heard surgeons of eminence speak of dilatation of a strangulated rupture on coughing, which I must confess I think impossible, if the rupture be more than incarcerated. Luke, however, as will be hereafter shown (p. 308), when he describes the mode of ascertaining the seat of stricture, in reference to the operation for its division external to the sac, has explained that this dilatation is not of the part strangulated, but of that part of the rupture immediately above the seat of stricture, whilst that below remains unaltered. Such dilatation may happen when the seat of the stricture is at a distance below the mouth of the sac, but where the mouth itself is strictured, it cannot be possible.—J. F. S.

Astley Cooper observes, that "when more than one irreducible *hernia* exists in the same person, it is sometimes difficult to determine which it is that requires operation;" and he mentions the case of a woman, in which there was a rupture in each groin and another at the navel. Her symptoms not being urgent, the operation was deferred, and she died on the same evening. On *examination*, "the tumour in the right groin was found to be an enlarged and inflamed absorbent gland, lying over an empty hernial sac. In the left groin was a portion of inflamed intestine, and at the navel was an irreducible, omental *hernia*, which had suppurated, and contained about a table-spoonful of matter." (p. 36–7.)]

1137. In a slighter degree of inflammation, and when it is long confined merely to the seat of strangulation, the symptoms are less violent and come on more slowly. The pain in the belly is not severe, but rather forcing, the belly remains soft, and not painful, the vomiting recurs at longer periods, and with less violence, the pulse is little or not at all altered. The symptoms first become more severe on the farther extension and increase of the inflammation.

1138. The *incarceration* from overloading the intestines lying in the rupture, or from collection of stools, occurs mostly in old and large ruptures, where the mouth of the rupture is wide and has lost its elasticity, after the patient has for some days felt unusual weight and dragging in the rupture, after using food difficult of digestion and flatulent; the rupture is little or not at all painful, not very tense, weighty and doughy to the feel, and requires greater pressure in attempting its reduction; the belly is indeed full and swelled up but not painful; if pain comes on, it intermits; then follow belchings, vomiting, and costiveness. This incarceration, if it cannot be got rid of by proper treatment, may continue a long time before the symptoms become urgent, but earlier or later inflammation accompanies them.

1139. If there be with this incarceration, spasmodic symptoms, or if they occur in consequence of chilling, (especially in the feet,) or if spasmodic colic exist in sensitive persons, hypochondriacal or hysterical women, and after ailments which produce spasmodic, flatulent, or bilious colic, the symptoms come on more quickly, the rupture although tense is little or not painful, often changes its form, becomes larger, and again smaller; the pain shifts its place, subsides and returns; the evacuation of the bowels ceases; the patient generally does not vomit often, only after some drinks, whilst others he retains; the pulse is small, contracted, and irregular; the urine generally pale; the respiration difficult; the symptoms often quickly attain a great height, but again subside. Inflammation supervenes earlier or later upon the symptoms above mentioned, and it is therefore necessary to be very careful not to be deceived by the symptoms of slight inflammation and to consider it as consequent on spasmodic affection.

1140. If the strangulation be not relieved, sloughing of the confined part is to be feared, and so much the more as the strangulation and inflammation are severe. The parts enclosed in the rupture are often gangrenous, without the external parts presenting any such change. But usually on the occurrence of gangrene the swelling loses its elasticity and painfulness, the skin becomes bluish-black at several places, emphysematous, and the *epidermis* separates; the painfulness of the belly and the vomiting cease; the powers sink; the pulse becomes small and irregular; cold sweats cover the limbs and face of the patient; the features are altered; the ideas become confused; the swelling bursts and discharges very offensive stool. Most commonly gangrene is the forerunner of death, the patient, however, may under these circumstances recover, the sloughy part of the intestine separates, and its remaining extremities adhering to the *peritoneum*, form an *artificial anus*.

1141. If the *omentum* alone be strangulated, the symptoms are geneally not so severe, because it can more easily bear compression in proportion, as its structure is not already changed. The inflammation, however, spreads from the constricted part to the other intestines. Although the relief of the bowels be not suppressed, yet belching and vomiting occur. The constricted *omentum* may pass into suppuration and gangrene (1). Suppuration is an uncommon result; an abscess may form above the constricted part which may empty itself into the belly. Sloughing often occurs without any great effect upon the general condition of the patient; the sloughy part separates, and the remaining part adheres to the opening.

[(1) Key (*a*) makes a very important remark in reference to strangulated omental rupture, which, however, I do not remember to have observed: he says:—"When from the nature of the symptoms the case appears to be merely an omental *hernia*, the operation must not be hastily proposed, for it is not easy to distinguish between inflammation of *omentum* which has been irreducible, and strangulation; for the inflamed state of the *omentum* without strangulation, the operation will afford no relief; on the contrary, it will aggravate the inflammation. It is highly advisable, therefore, to try the effects of active general depletion, and the application of leeches to the part, under which treatment the symptoms will often disappear. The result of operations on omental *hernia* which have been attended by acute symptoms, as great tenderness of the part, continued sickness, tense and tender belly, has been such as to induce me to try every means of allaying the inflammatory action before resorting to the operation. The operation in the cases that have come under my notice, has not suspended the symptoms, as it generally does in enterocele, but the patient has sunk within a few hours from the effects of the inflammation." (p. 36, *note*.)]

1142. The *treatment* of ruptures differs according to the different circumstances under which they are met with, namely, *reducible* or *irreducible, strangulated or gangrenous*.

1143. In *reducible ruptures* the indication is to reduce the protruded parts and to prevent their reprotrusion. This treatment is either *palliative* by wearing a truss, or *radical*, by the organic closing of the hernial opening.

1144. The *reduction of a rupture* (*Taxis*, *Repositio Herniæ*, Lat.; *Zurückbringung eines Bruches*, Germ.; *Repoussement de la Hernie*, Fr.) is best effected early in the morning, when the bowels are empty, and

(*a*) A. Cooper, above cited.

the person is in a position, in which the walls of the belly are as much as possible relaxed, and the place of the rupture is most raised; therefore on the back, with the rump raised, the knees drawn up, and the body inclined towards the side on which the rupture is. Previous emptying of the urinary bladder, and of the large intestines with a clyster or purge will facilitate the *taxis*. The manœuvre of the reduction itself consists in a sufficiently moderate pressure upon the whole swelling, according to the direction in which it has been protruded; or in the greater size and more oblong form of the hernial swelling, the fingers of the right hand are to be applied from the bottom around the swelling, the thumb and the other fingers of the left hand upon the two sides of the abdominal opening, and then it is to be attempted with the right hand to return the rupture according to its direction, whilst with the fingers of the other hand the parts returned are to be kept up. Often the *taxis* operates very easily, but often a part of the contents of the intestine must be first returned by a moderate pressure on the rupture. During the reduction the patient must avoid all contraction of the walls of the belly. In proper positions of the body, small ruptures often return of themselves.

[In attempting the reduction of a rupture by the *taxis*, it is always advisable to make gentle and steady pressure over the whole swelling for a few minutes, in order to empty into the belly any fluid contained in the sac, so that the protruded gut or *omentum* may be more effectually acted on by the fingers. The same pressure should also be employed with the hope of emptying some part or all the contents of the intestine, if any be down, by which its bulk being reduced, its return is considerably facilitated by the special pressure of the *taxis*. The fluid of the sac can generally be emptied, so that a very considerable reduction in the size of the swelling is effected, and the surgeon often fancies he has returned a large portion of the protruded gut or *omentum*, when in reality not the least part of it has moved, as the exposure of the bowel by the operation proves. The return of the contents of the gut depends on their fluid character, and on the tightness of the stricture, and is far less frequently effected than that of the fluid of the sac.

Violence in the use of the *taxis* is highly objectionable; instances have occurred in which the gut has been burst by it: one such case I have witnessed, and have known of others. Even when the injury is not so fatal, the violent squeezing to which a rupture is very commonly subjected, damages its contents, especially if intestine be down, by the bruising which results therefrom, and renders the success of a subsequent operation very doubtful. I have seen several instances in which the gut presented large patches of *ecchymosis* which could have arisen from no other cause; and I believe that to this rough handling is mainly attributable the unsuccessful results of operations when the rupture has been long strangulated, and the *taxis* has been repeatedly employed with an unsparing hand. The reduction should therefore be attempted only with great caution, and with moderate and careful pressure. If after the warm bath and bleeding, the rupture cannot be reduced by the *taxis* applied not beyond half an hour, I think it is best to proceed at once to the operation, as least dangerous to the patient. Occasionally it will happen that, after the surgeon's efforts have failed, the patient himself will succeed in returning the rupture; or he may suddenly become very faint, and the bowel return spontaneously, in consequence of the relaxation of the parts permitting the peristalic action of the intestines within the belly, or some accidental movement of the body, acting upon the portion within the stricture, so as just to shift its place, which effected, the return soon follows, even without the application of ice, or any other remedy to empty the vessels of the part.

It sometimes happens in the efforts made either by the patient himself or by the surgeon, to reduce a rupture, that instead of its contents merely being reduced, as in ordinary cases, the whole tumour, sac, bowel, and all, is thrust up into the belly, and the reduction seemingly effected, but the symptoms of strangulation still con-

tinue, and the patient dies; nor is it till after examination of the body that the cause of the mischief is found out. To this unhappy mode of returning a rupture the French surgeons have given the names *Réduction en bloc*, or *Réduction en masse*. It appears to have been first noticed by Le Dran (*a*), in a man with femoral rupture, which had been reduced twenty-four hours after its strangulation. The symptoms, however, did not cease, but continued for a week, at the end of which Le Dran saw him; but he was too nearly gone to admit of operation, and died the same evening. The surgeon first in attendance said, "that at the time of the reduction, he did not hear that noise the intestine generally makes when it enters into the belly; and that the parts composing the rupture passed in a heap under the ligament, like a tennis ball. * * * Upon opening the body we found the hernial sac in the belly, about three inches in depth, and eight in circumference, and within it was contained half an ell of the *intestinum jejunum*." (p. 14). Le Dran directs in such case that "a cut should be made where the rupture was, and that the ring should be dilated or the ligament divided, in order to draw the sac back with the fingers, or a pair of forceps. The sac should then be cut open, its entrance dilated, and the intestine reduced. The sac cannot be far distant, since it is a part of the *peritoneum* that lines the inside of the *pelvis*. (p. 21). De La Faye (*b*) and Arnaud (*c*) confirmed Le Dran's observation by their own experience; but the fact was disputed by Louis (*d*) on account of the presumed connexion of the sac with the surrounding parts, and its large size rendering its return beneath the crural arch very difficult. Richter (*e*), however, defended the statement of Le Dran. Another case occurred to Scarpa (*f*), in a boy of thirteen, in whom the symptoms of strangulation continued after the presumed reduction of the rupture; "in fact, in the dead body of this boy there was not externally the smallest appearance of tumour in the inguinal region; but on opening the *abdomen*, it was immediately discovered that the intestine, still strangulated by the neck of the hernial sac, had been pushed up along with the sac beyond the ring, where it was seen rolled up between the aponeurotic *parietes* of the *abdomen* and the great sac of the *peritoneum*." (p. 49; Engl. Edit. p. 143). Sabatier, Dupuytren, and Sanson, have also had cases of this kind, and Dupuytren has had not less than six of them (*g*).

It is a very curious circumstance, that although these cases of reduced ruptures in mass, do not seem to have been very rare in France, yet till very lately they have been scarcely ever noticed in this country. Lawrence says:—"I have never seen a rupture reduced in a mass in this manner in the living body; nor have I seen any example of such a reduction in pathological collections." (p. 94). And Key (*h*) observes:—"I have never known this to take place when the *hernia* has been reduced by the taxis." (p. 121). Sir Charles Bell mentions (*i*) a case of this kind, in which "a tumour was discovered quite within the muscular walls of the *abdomen*, which proved to be the strangulated intestine within the peritoneal sac; so that the surgeon had reduced the sac and the intestine within it; and the stricture which produced the strangulation being in the mouth of the sac, there was no relief, and the patient died." (p. 926).

In the Museum of the Royal College of surgeons there is an example of an inguinal rupture reduced in mass, and pushed between the abdominal and iliac muscles, and the *peritoneum*, part lying below the crural arch and extending outwards nearly as far as the external iliac vessels. It forms a considerable swelling inwards towards the cavity of the belly, but is not perceptible externally. The rupture was an old one, and the patient having worn a truss, was not inconvenienced by it, nor ever had difficulty in returning it, till it became strangulated.

Another case occurred in consultation to my friends Green and Callaway, in the year 1836, and to them I am indebted for the following particulars. The patient, it appeared, had several years before, whilst in Spain, had symptoms of strangulation and a swelling in the *scrotum*, which having been pushed up completely by a

(*a*) Observations de Chirurgie, &c. vol. ii. 12mo. Paris, 1731.

(*b*) Opérations de Dionis. Fifth Edit., p. 324, *note* A. Paris, 1716.

(*c*) Traité des Hernies, vol. ii. p. 96.

(*d*) Mémoires de l'Acad. de Chirurgie, vol. iv. p. 299.

(*e*) Programma, in quo demonstratur herniam incarceratum una cum sacco suo reponi per annulum abdominalem posse, etc.

(*f*) Above cited.

(*g*) Dictionnaire de Médecine et Chirurgie pratiques,—Art. *Hernie*, vol. ix. p. 571.

(*h*) Above cited.

(*i*) London Medical Gazette, vol. xiii.

Spanish surgeon, after a time the symptoms subsided; and he was not farther inconvenienced until the attack now to be mentioned. On this occasion there was a swelling on the left side of the *scrotum*, irreducible but transparent, and accompanied with symptoms of strangulation. No relief was obtained by medicine, and it was determined to perform an exploratory operation. A cut was made into the swelling, the fluid evacuated, and the finger being introduced, readily passed in and turned freely about, and the intestines were felt as it seemed, in the belly, and free from strangulation. The symptoms, however, continued, and the patient died four days after their onset. On *examination* it was found that the cavity, opened in the *scrotum*, did not, as supposed, permit the finger to pass directly into the general cavity of the *peritoneum*, but into a large sac lying between the iliac *fascia* and the *m. iliacus*, in which were contained intestines, and these were strangulated in a small aperture at the upper inner side of the sac, where was the communication with the cavity of the belly. The testicle lay behind the scrotal sac, just at the external abdominal ring. Green supposes that the rupture was originally congenital, and that when the patient was in Spain, the surgeon had violently thrust up the whole rupture and the testicle into the belly, the sac doubling on itself; but that the intestine had then partially or completely relieved itself, and that afterwards the sac had lengthened downwards, forming the swelling filled with fluid which existed in the *scrotum*, and had been cut into.

The next case recorded, is that under Bransby Cooper's care in 1839, already mentioned, (*par.* 1117), in which there were two sacs.

The attention of English surgeons was certainly, however, scarcely drawn to the reduction in a mass of rupture, by the taxis, till Luke's paper (*a*) was read before the Medico-Chirurgical Society, in the spring of 1843; and a perusal of the discussion thereon (*b*), clearly proves, that although it was attempted to show the subject had been previously well known, yet none of the speakers produced reference to any other than the few cases which I have already noticed, neither did any one allude to those of Dupuytren or Sanson. It must therefore be admitted, that Luke is fairly entitled to the credit of having brought the subject fairly before English surgeons, for although he has also availed himself of the experience of the French, he mentions not less than five cases which had come under his own notice, three of which were after death, and two he had under treatment, and gives account of; one of which would not submit to an operation and died, whilst the other was operated on and recovered.

The possibility of returning a rupture in mass, which had been doubted or denied, was clearly proved by Jules Cloquet (*c*) in his experiments on the dead subject. He says:—"When the neck of the sac does not adhere very strongly to the aponeurotic opening, and the latter is also somewhat dilated, which is not uncommon, in pushing violently the rupture towards the cavity of the belly, the cellular adhesions of the neck, and of the aponeurotic ring lengthen and break; the two openings which were near, separate from each other; the former sinks, passing inwards, whilst the latter retains its place. Whilst the *taxis* is employed the cone above the neck of the sac on its abdominal side becomes very prominent and much lengthened, is no longer formed as in the former case, (where the neck of the sac adhered closely to the aponeurotic opening), by the whole thickness of the abdominal wall, but merely by the *peritoneum* raised and detached from the muscles, by the sac which endeavours to get between those parts. The sac re-enters successively, and by little and little, through the aponeurotic ring as it dilates; and towards the end of the experiment it escapes suddenly, and gets behind this opening. It is then easily felt through the abdominal walls, by placing the finger on the spot which the rupture had occupied; it forms a large, hard, round, chestnut-like tumour deeply-seated above the ring. In this case the reduction is complete, the rupture has returned *en bloc*, and is situated between the abdominal *peritoneum* and the posterior surface of the aponeurotic ring. The ring contracts slightly, by its elasticity, as soon as the sac has entirely slipped over it, and to a certain point prevents the reappearance of the tumour externally. This reduction *en bloc* is sometimes followed by a slight rush in consequence of the hasty passage of the bottom of the sac through the ring; but this rush

(*a*) Cases of Strangulated Hernia reduced *en masse*, with observations; in Med-chirurg. Trans. vol. xxvi. p. 159.

(*b*) Lancet, 1842–3, vol. ii. p. 242–45.

(*c*) Recherches sur les Causes, &c. above cited.

never happens when the ring is very loose and wide. * * * When this last condition exists the tumour goes in and out with equal readiness. I have accomplished reduction in mass in about twenty-five instances, partly of ruptures either strangulated or otherwise irreducible, partly of empty hernial sacs. It is effected most easily in internal (direct) inguinal, then in crural, and lastly in external (oblique) inguinal ruptures. I have never succeeded in umbilical ruptures in adults. When the sac is of considerable size, when it adheres closely to the surrounding parts, when the aponeurotic opening is small, and in the form of a canal, circumstances which are frequently met with in external (oblique) inguinal ruptures, this kind of reduction is almost impossible, unless great force is employed. * * * The replacement in mass of a rupture strictured by the neck of the sac, takes place most easily when the aponeurotic ring is of large size and short; when the sac and its neck are loosely connected to the surrounding parts; and when the protruded *viscera* adhere together, and to the sac, so that reduction in the usual way is impracticable. In a case of internal (direct) inguinal and in another of crural rupture, I found that the tumour could only be returned in a mass, although the neck of the sac was not narrow, in consequence of close adhesions between the protruded parts and their peritoneal covering." (pp. 113–15).

The following are some of the more important of LUKE's pertinent observations (*a*) in reference to the existence of a rupture reduced in mass, when without any tumour symptoms of strangulation are present:—"The too exclusive reliance upon the absence of tumour as a sign of the non-existence of a *hernia*, may, in certain cases, be highly dangerous. In suspected cases, more security will be derived from the institution of inquiries concerning the *previous existence* of a tumour in the part, and of its conditions when ascertained to have existed, such as its hardness, or the reverse, its freedom from pain, and also the amount of, and the manner of applying the force used for its reduction. By such inquiries, not only may the dependence of the symptoms of intestinal obstruction upon hernial strangulation be determined, but also the presumption of a reduction *en masse* may be raised or removed. Should such a presumption be raised, the surgeon will then be prepared to push his inquiries farther, and to seek for indications to direct his *diagnosis*, which are not usually sought for in ordinary examinations. The mode of proceeding to render these indications available to our use, is twofold. That, however, will in prudence be first adopted which requires mere manual examination without incision, while the second should be had recourse to, provided the first tends to strengthen the presumption of a reduction *en masse* previously raised. * * * It is a circumstance worthy of remark, that the firmness of the adhesions of the parts in which it is embedded, bears no proportion to the duration of the hernial protrusion, as might be, *à priori*, expected; for in all the cases (of reduction in mass) related, the *hernia* had been of some years continuance, yet in each was reduced without the employment of much force.

"The presence of sac, even without hernial contents, causes an abnormal fulness in the part, easily ascertainable by examination. The absence of such fulness in a part, when *hernia* is known to have previously descended, necessarily leads to the conclusion that the sac upon which it depended has been displaced, and probably returned, together with the *hernia*. The sac in inguinal *hernia*, below the external ring, becomes united with the spermatic cord, whereby the latter is usually rendered indistinct and obscure. The absence of that indistinctness and obscurity implies the removal of the cause which previously produced them, and, therefore, that the sac has been displaced. The continuance of the indistinctness and obscurity leads to a directly contrary conclusion. When a *hernia* descends from the *abdomen*, the aperture through which it descends is always enlarged and dilated. This fact is ascertainable by the introduction of a finger, a circumstance which becomes available to the *diagnosis* in these cases. Should a large aperture be detected, a previous hernial descent may be inferred. Under ordinary circumstances of *hernia*, when the contents are reduced into the *abdomen*, the area of the aperture is occupied by the remaining sac, while its margins are rendered more or less obscure. If, then, a large aperture be found free and unobstructed, with its margins unobscured, there is raised not only a presumptive evidence of the previous protrusion of a *hernia* at the

(*a*) Cases of Strangulated Hernia reduced *en masse*, with observations, in Med-Chir. Trans., vol. xxvi.

part, but also the farther evidence of the displacement and probable return into the *abdomen* of the sac by which the *hernia* had been invested. We are led to a contrary conclusion by contrary circumstances. These, I believe, are the only indications useful to *diagnosis*, resulting from changes caused by the previous descent of a *hernia*, at or below the abdominal ring.

"Nor does the examination of the inguinal canal afford any available information, unless a tumour be discoverable in its course; a circumstance which, by the clearness of the evidence it affords, renders the *diagnosis* comparatively easy, and affirmatively conclusive, but constitutes a description of case not intended to be included in the scope of the present observations, which are directed exclusively to cases unattended by any external appearance of tumour.

"Yet in conducting an examination of the *abdomen*, immediately above the seat of the internal ring, some corroborative evidence of a reduction *en masse* may sometimes be obtained. Thus it may be expected, that if such reduction has been effected, the inflammation of the hernial contents will cause a circumscribed pain in the seat which it occupies, while a fulness, or even the rounded form of the *hernia* deeply situated within the abdominal *parietes*, may possibly be cognizable upon a minute examination; yet the absence both of circumscribed pain, and of fulness or rounded form should not lead to a negative opinion; for, in the first case, neither pain nor fulness existed, yet subsequently a mass of strangulated intestine was discovered at the part. Their presence, however, may be taken as corroborative of an affirmative opinion, founded upon the manual examination previously instituted.

"If circumstances justify a suspicion of a reduction *en masse* in any case, they will also justify attempts to cause reprotrusion of the tumour, that by bringing it into view, the obscurity of the *diagnosis* may be wholly removed. With this intention, as advised by surgeons of authority in such matters, the patient should be placed in the erect posture, and be requested to cough forcibly, to strain and to make exertion. This course of proceeding seems likely to be of use, when the hernial tumour is either in the inguinal canal or at the internal ring; but if it be reduced within the *abdomen*, as in the cases related, beyond the situation of the ring, the probability of affecting its reprotrusion will be much diminished, and consequently an opinion of the non-existence of a reduction *en masse*, drawn from the non-appearance of a tumour, is to be cautiously avoided."

Although, after "the most rigid local manual examination, the indications afforded for our guidance are so obscurely marked," as to afford "a sufficient explanation why surgeons, under these circumstances, are usually unwilling to have recourse to ulterior measures of examination, by submitting the patient to the certain pain and possible danger of an exploring operation, yet such unwillingness may prevent the adoption of the only means of preserving the patient's life. As the doubts and difficulties of such cases can be removed only by the light which an operation of exploration affords, it is the obvious duty of the surgeon to make that unwillingness yield to the pressing emergencies of the occasion. * * * It should be remembered that an unsuccessful attempt is infinitely to be preferred to no attempt at all, and that passiveness on his part may be more destructive to life than any incisions which he may be required to make." (pp. 175–79.)

With these observations of Luke I most fully concur, and more especially, because there appears to be pretty good grounds for finding the reduced rupture at a particular spot, as Dupuytren (*a*) observes:—"When the hernial tumour is reduced in mass it cannot move about in the belly, because it is formed, in part at least, by the *peritoneum*, which although moveable, remains always in the region to which it belongs, and consequently retains the tumour. The rupture is then permanently behind the opening, by which it has returned and resting on its internal surface. Surrounded by the cellular tissue, which had previously united the *peritoneum* to the wall of the belly, and which has been displaced to receive it, the returned tumour is found, besides, to be covered with a second layer of *peritoneum*, which is actually that detached from the hind surface of the belly; so that to penetrate the hernial sac, by cutting through the abdominal wall, the *peritoneum* must be twice cut, and its cavity opened before reaching the cavity of the sac, unless the operation were performed like that for tying the external iliac artery, by raising and detaching the serous membrane. Dupuytren does not, however, advise either cutting through,

(*a*) Above cited.

the *peritoneum* and opening the abdominal cavity, or turning off that membrane to get at the hernial sac. "There is fortunately," says he, "a more simple and less dangerous mode of treatment, which consists in seeking for and drawing down the rupture by the opening through which it had passed into the belly, being assured it will be found resting on the internal surface of that opening, where it can be laid hold of with the forceps, and drawn out, with or without cutting the edge of the ring. If the tumour be examined through the cavity of the *peritoneum*, it will be seen lodged in the iliac pit, a little more outwards in crural rupture, a little more inwards and deeper in inguinal rupture. It presents a narrow, tight opening, in which two ends of the intestine are plunged, forming a loop in the cavity of the sac. It is at this point that the intestines are compressed, narrowed, shrunk, strangulated, and mortified, the upper end more frequently than the lower; the former bulges almost to bursting; the latter, shrunk, empty, and like the intestines of a child." (pp. 592–94).

"In conducting operations of exploration," observes Lawr., "the indications which are to be sought for, are, for the most part, of a similar nature to those already mentioned, as useful in the manual examination. They are, however, more satisfactory and distinct, inasmuch as the parts to be examined are, by our incisions, brought immediately into view, and are not obscured by the interposition of superjacent structures. Thus by the perfect exposure of the inguinal ring, * * * if the size of the ring be normal, a *hernia* has not descended through it; or if it be larger than the normal state, yet occupied by an empty sac, an evidence of the previous existence of a *hernia*, together with an evidence of the reduction of the *hernia* without the sac being also reduced, is established. But should the ring be found large and free from other obstructions than the cord, and if the cord be distinct and unobscured by the presence of a sac, and a void is found where fulness is to be expected from the previous history of the case, a strong presumptive evidence on the contrary side is established, that the *hernia*, together with its investing sac, is reduced.

In proceeding with the exploration, the inguinal canal is next laid open. * * * I hold a close observance of the condition of parts within the canal to be a matter of very great importance. It will be recollected that the ordinary oblique inguinal *hernia*, during its passage through the canal, lies anterior to the spermatic cord. The hernial sac, when left empty after the reduction of its contents, occupies the same relative situation, and consequently overlays and obscures the cord after the canal is laid open. If the reverse of this is found in a case where a hernial descent is known to have previously existed, and the cord is ascertained to be clearly and distinctly brought into view, throughout the whole extent of the canal we may justly conclude, that the distinctness and clearness with which the cord is seen are caused by the removal and consequent reduction of the hernial sac from over it, which reduction can be effected in no other direction than into the *abdomen*.

"The condensed cellular capsule (usually found) immediately investing the sac * * * has but little connexion with the sac, and will remain even when the sore has been reduced. * * * If found and ascertained to be empty, the circumstance is of a very conclusive character, and moreover will afford a direct clue to the situation of the *hernia*. A finger introduced through an opening made in such capsule, will be conducted towards or through the internal ring, beyond which it will be brought into contact with the hernial tumour itself, having in the introduction passed through the same channel by which the reduction was effected.

"The indications to be noticed at the internal ring are of a similar nature to those mentioned as being found at the external ring, and relate to the size of the aperture and the structures by which it is occupied.

"It will be observed that up to this period the proceedings of the exploration have been conducted without any danger of importance, and without any necessary disturbance to the *peritoneum*, yet information of the most conclusive kind may have been obtained, and such circumstances brought under notice as could fully justify the operation, even if manifold, more hazardous than it really is. * * *.

"The operation may be conducted to a demonstrative conclusion, by ascertaining the existence or non-existence of a hernial tumour, without adding materially to the trifling danger already incurred. This is accomplished simply by the introduction of the finger through the internal ring, and by passing it from side to side. Should a hernial tumour be present it will at once be recognised, and found lying externally to the general peritoneal membrane, although within the *parietes*, and presenting a

rounded surface. Should a tumour be not present, the circumstance may be ascertained by observing the smooth surface of the *peritoneum*, and the continued adhesions which it maintains with the *parietes* immediately surrounding the ring. If doubt still exists, an enlargement of the internal ring, by division of the adjoining *transversalis fascia*, will afford a clearer exposition of parts, and a more decisive evidence for either an affirmative or a negative conclusion; and thus an exploration may be conducted to its termination without the necessity of any peritoneal section.

"When the doubts have been resolved in the affirmative, by the discovery of a hernial tumour, the tumour may be brought into the inguinal canal, so as to occupy its former situation before reduction, by enlarging the ring to the requisite extent for its passage. It may afterwards be opened, and its contents dealt with according to their condition, as under the ordinary circumstances of common operations. * * *

"The sac should in all circumstances be opened, and its neck freely divided, so as not to leave any impediment to reduction of its contents into the general peritoneal cavity. It should be recollected also, that the adhesion of the sac to the surrounding parts has been severed, and that consequently the sac will be liable to be again reduced during the reduction of the contents into the *abdomen* unless caution be used for its prevention. The danger of this occurrence may be always obviated by the introduction of the finger through the neck of the sac, after the contents have been reduced, for thus the fact of their perfect liberation may be readily ascertained." (pp. 180–85.)]

1145. If the rupture be completely reduced, which can be determined by introducing the finger into the abdominal ring, its re-descent is to be prevented by continual suitable pressure, which is to be made by proper bandages, *Trusses*, *Bracheria*, Lat.; *Bruchband*, Germ.; *Brayer*, Fr.,) upon the hernial opening.

Upon the subject of Trusses, see

Camper; in Mémoires de l'Académie de Chirurgie, vol. v.

Javille's Traité des Bandages Herniaires. Paris, 1786.

Brünninghausen, Gemeinnütziger Unterricht über die Brüche dem Gebrauch der Bruchbänder und über das dabei zu beobachtende Verhalten. Würzburg, 1841; with one Plate.

Lafond, J. J., Considérations sur les Bandages Herniaires usitées jusqu'à, ce jour, et sur les bandages renixigrades ou nouvelles espèce de brayer. Paris, 1818.

Döring, Art *Hamma;* in Rust's Handbuch der Chirurgie.

Cooper Astley, above cited, p. 21.

Cloquet, Art. *Brayer*; in Dict. de Médecine, vol. v. 1834.

[Chase, H. On the Radical Cure of Hernia by Instruments, &c. Philadelphia, 1836.

Report of the Committee of the Philad. Med. Soc. on the construction of Instruments, &c. Philadelphia, 1837.—G. W. N.]

1146. *Trusses* are either *elastic* or *inelastic*. The latter consist of a strap of fustian, leather, or the like, and of a *pad*. When applied, they may not yield to the movements of the coverings of the belly, may therefore be very easily displaced, the intestines slip from them, and if this be prevented by drawing tight, painful pressure is produced. Upon these grounds the inelastic trusses are to be altogether rejected.

1147. *Elastic trusses* consist of, *first*, a *spring; second*, a *pad;* and *third* of a circular *strap*. The *spring* is a narrow flat piece of well-hardened steel, which bends in a semi-circle around the diseased side. A plate of steel is attached in front to the spring and its inner surface padded with wool or horse-hair, so that it may form a soft but regular arching, this part is called the *pad*. At the hinder edge of the spring is a circular strap, which passes round the other side of the body, and is

fastened to a button on the outer surface of the pad. The whole truss is to be covered with soft leather and lined on the inside, so that it may not make any troublesome pressure.

1148. The truss must be made with great care in each of itsparts, and be fitted to every individual case. The *strength of the spring* must correspond to the resistance which it has to afford, and fit well to that side of the body on which it is applied. The *pad* must have a *size* corresponding to the bulk of the rupture, and the *angle* at which it stands from the spring correspond to the surface on which it is applied, which it has been also attempted to effect by a *moveable pad*, in order to suit it to every case. The *pad* must not be *too soft* nor *too hard*, and its convexity must be such that it may be regularly over the whole hernial opening; pads of hard wood, ivory, or filled with air, (Cresson and Sanson,) are less certain and suitable. If the circular strap alone be insufficient to keep the truss in its proper place, we must endeavour to prevent its displacement by a second strap, carried between the thighs.

In order that the truss may be sufficiently firm, it is necessary in every case to take the size, by means of a bandage carried round the body from the seat of the rupture and in the direction on which the truss is to lie; or for the same purpose, a double piece of flexible wire may be used, with which the necessary curve can be given; about an inch must be added to the size on account of the covering of the strap.

1149. The truss is to be applied after the proper use of the *taxis* for the reduction, whilst with the fingers the intestines are kept up, till the pad be properly applied on the hernial opening, and the strap be fastened. The patient should then cough, and stand up, to determine that the truss is not put on too tightly and that the parts are well kept up. The surgeon should always apply the truss the first time; subsequently the patient may do it himself, but it should be whilst lying on his back and early in the morning; he should also have several trusses for the purpose of change. The part on which the truss rests should be frequently washed with brandy, till the teguments are accustomed to its pressure. If excoriations occur, the parts should be washed frequently with lead wash, whitelead should be strewed over it, and a thick piece of linen applied beneath the truss.

1150. Various diseases in the neighbourhood of the opening upon which the pressure must be made, and an imperfectly reduced rupture may prevent the use of the truss. Large ruptures are extremely difficult to reduce, and often new ruptures occur afterwards in other parts. In children the use of an elastic truss is not only accompanied with no injury, as many suppose, but is to be preferred to the use of an inelastic one.

1151. When an adhesion prevents the return of a rupture to such extent that part of it remains external, a truss with a hollow pad may be used; but in very large irreducible ruptures a suspendor sufficient to enclose it, should be used to prevent the farther protrusion of the intestine. In these ruptures the gradual return is effected by long-continued lying on the back, by slender diet, purging, frequently cold applications over the rupture, and by daily repeated attempts at reduction, which has occurred to me in several cases of very large and adherent ruptures. When in large ruptures the walls of the belly are so contracted that the

parts in the rupture have scarcely any room in the belly, the same treatment is indicated. Frequently in such cases, after the reduction and the application of a truss, anxiety, oppression, pain, small pulse, and so on occur, and it becomes necessary to remove the truss, after which the symptoms, as I have observed, subside.

1152. When the intestines are properly kept up by the truss, the hernial sac gradually contracts, and at the same time a slow inflammation arises, consequent on the pressure of the truss, by which perfect adhesion of the neck of the hernial sac takes place, and thus a *radical* cure is effected. This commonly happens in children, frequently in adults, but never in old persons. On account of this gradual narrowing of the neck of the hernial sac, under the continued use of the truss, the latter may not be again removed if it be not believed certain that the radical cure is effected; because otherwise, in repeated protrusions of the intestines, strangulation may also arise from the contracted neck of the sac. Whilst the patient wears the truss he must avoid all violent exertion.

[Cloquet considers that a hernial sac may be returned spontaneously into the belly in four different ways. *First*, by the contractility it possesses in common with other tissues, having a constant tendency to retract the sac upon itself, after its distension, and which is, in some cases, sufficient to produce a gentle and gradual return. "The sac then takes a retrogade movement to that of its formation; the *peritoneum* passes from the ring towards the parts it had left, that portion of this membrane, which had been drawn towards the ring without passing through it, pulls the neck in every direction, which expands, turns out in some degree, disappears, and at last is effaced; the sac unfolds, and again uncovers the wall of the belly, near the aponeurotic opening. The neck of the sac, which was last formed, disappears first, whilst its bottom disappears last, and with great difficulty, so that the reduction is often incomplete." (p. 74.) When a rupture has been thus reduced, the remains of the neck are sometimes observed at a little distance from the ring, in the shape of irregular *stygmata*, whitish, and more or less opaque. The *peritoneum*, which formed the sac, is restored to the abdominal wall. * * * Sometimes these sacs are so completely effaced, that no trace of them can be found in the *peritoneum* covering the ring by which they had escaped. The only indication of a rupture having existed at this spot, is a cellular, whitish, empty pouch, arising from the aponeurotic ring." (p. 76.) *Second*, "by the closing, the gentle and insensible contraction of the cellular tissue external to the sac. The other tunics may concur also; but their action appears more weak, and less demonstrable. * * * In this case the *peritoneum* presents at the top of the ring irregular prominent folds, analogous to those of the mucous membrane of the stomach during the contraction of its muscular coat." (pp. 78, 9.) *Third*, by the displacement of the *peritoneum* from the abdominal wall from various causes, as in two cases of direct inguinal rupture, in which, in consequence of retention of urine, the *peritoneum* covering the bladder was raised nearly to the navel—by enlargement of the womb by pregnancy, or any other cause—by adhesion of the *omentum*, or intestine to the hernial sac—by a large quantity of fat collecting between the *peritoneum* and wall of the belly—or by the dragging of another sac which has formed in the neighbourhood of the former. *Fourth*, by the contraction of the cremaster muscle; "the two fleshy bundles of which act upon the sac pretty much as the two bellies of the digastric muscle effect the direct elevation of that bone." (p. 83.)]

1153. The *radical cure* of reducible ruptures (especially inguinal ruptures) was attempted in ancient times in very different and in part cruel and barbarous ways, which had only their corresponding excuse in the ignorance of, or in the bad construction of trusses. Even later modes of treatment have found little favour, on account of the danger therewith connected, and because of the more perfect construction of trusses; and only of late have these objects again attracted more attention, and

less dangerous methods of treatment have been proposed. All the modes of treatment in reference to the radical cure have for their object the organic closing of the neck of the hernial sac, or of the abdominal ring, or to effect both at once, which has been attempted by a sufficient degree of *adhesive* or *suppurative inflammation*, and thereby causing *adhesion;* or by a *plug of skin healed into the abdominal ring*. These may be collected together under the following heads: *first*, Increased pressure whilst lying constantly on the back, with, or without the simultaneous application of irritating and contracting remedies; *second*, Caustics and the actual cautery; *third*, Ligature of the sac, with or without cutting it off; *fourth*, Introduction of foreign bodies into the hernial sac; *fifth*, Healing-in of a detached portion of skin, or of a portion of infolded skin, into the abdominal ring.

1154. Increased pressure, whilst the patient lies constantly on his back, heretofore employed by Fabr, Hildanus, Blegny, Winslow and others, has of late been recommended by means of a common pad, (Richter and others,) with a conical linen pad, the point of which is inserted into the abdominal ring by means of an elastic truss; the supine posture is to be continued at least four weeks, till superficial ulceration take place, which should be dressed with lead cerate, and the truss still applied tightly for some time (Langenbeck) (*a*); at the same time a sponge dipped in turpentine, or a blister, is to be put on beneath the pad (Boyer); with a pad of which the power can be increased by means of a compressing screw, with a pressure apparatus moistened with alum wash (Ravin) (*b*); or with a pad filled with contracting herbs, and subcarbonate of ammonia (Beaumont) (*c*).

Various irritating and astringent remedies have been mentioned which have been employed in blisters, bags, pads and as washes; to wit, bark, tormentilla, gall nuts, oak bark, rhatany, alum, turpentine, ætherial oils, naphtha, washing with cold water, iron bullets, cold river bathing, and so on. Jalade Lafond (*d*) employs a pad with a reservoir for holding caustic.

1155. The application of the *actual cautery*, derived from the Alexandrian school and first described by Paulus Æginета, and of *caustic* (recommended from early times, from Avicenna up to Kern) closes the hernial opening by destroying the skin and hernial sac, and forming a hard scar connected with the bone. After the rupture has been returned, and the cord drawn aside, the cautery is to be kept so firmly upon the abdominal ring, that it burn deeply through the skin and hernial sac down to the bone. In the same way caustics are to be applied, viz., caustic potash, arsenic or sublimate with opium, lime, sulphuric acid, one part of caustic potash, two of gum-arabic, and some water (Kern). The cautery as well as the caustics have also been applied upon the hernial sac laid bare by incision (Franco, Monro).

1156. *Tying up the hernial sac* with the *ligature* (*ligatura sacci herniosi*, Lat.; *Zusammenschnürung des Bruchsackes*, Germ.) and *stitching* (*sutura*, Lat.; *Naht*, Germ.) are performed in different ways: *first*, after the

(*a*) Abhandlung von den Leisten und Schenkelbrüchen, p. 121.

(*b*) Essai sur la Théorie des Hernies et de leur étranglement, et de leur cure radicale. Paris, 1822.

(*c*) Notice sur les Hernies et une nouvelle manière de les guérir radicalement. Paris, 1827.

(*d*) Remarques nouvelles sur la cure radicale des Hernies sim ples sans opération sanglante. Second Edition. Paris, 1841.

already directed reduction, encompassing the sac with a needle and tying together both it and the spermatic cord with a ligature; *second*, after previously laying bare the sac by an incision, encompassing the hernial sac and the spermatic cord with a needle, and introducing a golden thread which can be so drawn as to close the hernial sac, but the spermatic cord is not to be compressed, (the *golden puncture*, *punctum aureum*) (BERARD, FRANCO); *third*, tying the hernial sac and the spermatic cord, and cutting both off below the ligature, or first cutting off both and then tying them (the *rupture-cutter* of the middle ages); *fourth*, separation of the hernial sac from the surrounding parts, and then tying it with a leaden thread, (PARE,) or closing it with the glover's stitch, the royal stitch, (*sutura regia*,) (NUCK, FABR. AB AQUAPENDENTE, GUY DE CHAULIAC, and others,) or simple tying with a waxed treble or quadruple thread. (LE DRAN, FREITAG, SENFF, SCHMUCKER, THEDEN and others,) in modern times LANGENBECK and KERN, the latter of whom, in omental rupture, tied the exposed *omentum* near the abdominal or femoral ring, so that the remaining part of the *omentum*, by uniting with the walls of the ring, closed it up; *fifth*, incision into the integument and hernial sac, and treating as after the operation for strangulated rupture, with simple lint dressing and light pressure with a spica bandage or truss, (PETIT, LIEUTAUD, LEBLANC,) or with simultaneous scarifications of the hernial sac, (FREITAG, MAUCHART, RICHTER,) or with the introduction of tents of lint (DIONIS, MERY, ARNAUD, SCHREGER, VON GRAEFE, VON WALTHER and others.) Here also belongs the injection of red wine, recommended by SCHREGER, and the inflation of air into the hernial sac, the mouth of the sac being carefully closed with pressure.

1157. The *inhealing of a plug of skin*, to close the mouth of the sac, is effected in two ways:—1. According to DZONDI's proposal (*a*), to heal within the abdominal ring, purposely wounded a sufficiently large fold of skin, formed by an incision of the skin; JAMESON (*b*) made, in a femoral rupture, a fold of skin two inches long, and an inch wide, thrust it into the femoral ring, and united the edges of the skin, with stitches. 2. GERDY's inhealing of the skin, ensheathed in the inguinal canal (*c*). After the patient is placed, as in the operation for strangulated rupture, a finger of the left hand, smeared with cerate, is to be placed somewhat beneath the hernial opening on the *scrotum*, and then the *scrotum* in front of it is to be thrust along the spermatic cord as deeply as possible into the inguinal canal. In this blind sac the finger is to remain, and the skin is to be thrust as far as possible towards the outer wall of the inguinal canal. A curved needle, with two cutting edges, and with a handle, and its eye armed with a double thread, is then to be introduced, on the palmar surface of the forefinger, to the bottom of the ensheathing, and whilst the handle of the needle is depressed, the needle itself, its convex surface resting on the palmar surface of the finger, is to be thrust, whilst an assistant presses the external skin against its point, from behind, forwards through the front of the ensheathed part of the *scrotum*, and the front wall of the inguinal canal, so that the needle projects some lines above the inguinal ring. The one end of the

(*a*) Geschichte des klin. Institutes zu Halle. p. 117.

(*b*) The Lancet, vol. ii. 1829, p. 142.

(*c*) Bulletin de Therapie, 1835.—FINK Ueber radicale Heilung der Brüche. Freiburg, 1837; with two copper plates.

thread is now to be drawn out, and given to an assistant, the left finger still remaining in the ensheathing. The needle, in the eye of which the other end of the thread remains, is now again to be passed upon the finger, at some lines' distance from the former stitch, thrust through externally, and the thread withdrawn from it. After the removal of the needle, the threads are to be divided, and a cylinder of plaster placed between them, upon which they are to be tied, and the ensheathed part of the *scrotum* is firmly retained in its place. If the entrance and canal of the rupture be much enlarged, two other stitches must be applied; but in general, one is sufficient. The sac formed by the ensheathed skin, is to be then pencilled with caustic *liquor ammoniæ*, to excite inflammation, the part operated on, covered with a pad, spread with cerate, and covered with a compress, and the patient put to bed in such position, that the rump and the head are somewhat raised, and the thighs drawn up. In all cases phlegmon follows, which spreads over the whole extent of the stitches, and runs into suppuration, the *pus* discharges itself through the stitches, along the threads, which, at the same time, also act as guides to it. If the adhesion have taken place in from three to five days, the stitches may be removed. Towards the fifteenth or twentieth day, the suppuration ceases, the ensheathed skin forms a plug, which externally appears like a swelling, but gradually subsides. The patient must, for four weeks, observe the supine posture, and the treatment must be conducted according to the inflammatory symptoms which may come on. Signoroni (*a*) thrusts up the skin, like the finger of a glove, into the sac of the rupture, and fixes it by means of a female catheter, then pierces it with three long hare-lip needles, four lines apart from each other, and twists around each an ∞-shaped thread. The needles are left six or eight days. Würzer (*b*) retains the skin thrust up into the inguinal canal, by means of a cylinder, on the under part of which is fastened a plate which fits the outer surface of the inguinal canal. A needle is thrust through the upper part of the cylinder, outwards, and brought out by an opening of the external plate.

Here must also be mentioned Garengeot's proposal, according to the experiment once made by Petit, that strangulation existing, if the mouth of the sac were expanded with one wound, and the open hernial sac thrust back into the belly, the radical cure followed: this treatment might also apply to the attainment of the radical cure, as well also as the reduction of the exposed sac according to Hummel and Stephens.

[(1) Bransby Cooper (*c*) has performed Gerdy's operation. The application of the caustic ammonia caused intense pain in the part, for a few hours after the operation, but no pain in the belly. On the fourth day, suppuration having been freely established, the ligature was removed, but the pressure was continued. On the fifth day, there appeared a degree of fulness about the margin of the opening, as if a portion of the inverted skin had descended, but without any descent of the intestine, and the hardness and swelling about the inguinal canal still led to the reasonable hope that the operation would prove successful. After some days, as the tenderness diminished, greater pressure was made. On the twenty-fourth day, a weak truss was applied, and he continued in bed ten days longer, after which time however he would not be confined, but got up and walked about, and soon after left the hospital. But he had a slight return of the rupture].

(*a*) Bulletino Medic. de Bologna, 1836, Dec. Froriep's neue Notizen, vol. ii. p. 272.

(*b*) Organon für die gesammte Heilkunde, vol. i. pt. 1.

(*c*) Guy's Hospital Reports, Oct., 1840, pp. 270–75.

1158. The most modern practices which may be placed next the former, are those of Bonnet, Mayor, and Belmas.

Bonnet (*a*) employed the same treatment as for *varicocele*, introducing needles upon the hernial sac, and allowing them to remain. The rupture having been reduced, the *scrotum* is to be grasped with the left hand, as close as possible to the abdominal ring, and the spermatic cord brought into the circle formed by the thumb and forefinger of this hand; a pin, with a piece of cork on its head, is to be thrust, close to the suspensory ligament of the *penis*, from the point of the finger nearest it, from behind and above, forwards and downwards, through the integuments and the hernial sac. A second piece of cork is to be fixed on the projecting point, and brought near the first piece, so that the intermediate soft parts are easily compressed; and in order to keep the second piece of cork in its place, the point of the pin is bent down. The spermatic cord is to be placed between this pin and the tip of the thumb and forefinger of the left hand, and a second pin is then introduced six lines distant externally from the first pin, parallel to it, and fastened in the same way. If the spermatic cord have been divided by the pressure of the intestine, into its several parts, a third pin must be passed six lines from the second, so that the other parts of the cord may be placed between the second and third pins. Usually, about the fourth day, pain and inflammation come on; but the pins are not to be removed till the inflammation has acquired a certain degree of intensity, and the hindmost piece of cork has excited ulceration of the skin, which occurs about the sixth, or even at the twelfth day. By this proceeding, not merely is the hernial sac, but also the abdominal ring closed, and united with the neighbouring parts by the effused lymph.

Mayor (*b*) has modified this practice, by forming at the abdominal ring a *longitudinal fold of skin* varying in size according to the bulk of the rupture and the width of the abdominal ring, to the middle of which corresponds a line drawn over the middle of the hernial swelling; through the base of this fold of skin, held up by the fingers, a needle, armed with a double thread, is to be passed, the ends of which being separated on each side, are to be tied on a piece of bougie, or on a piece of cotton, or of sponge properly tied together. The number of stitches is determined by the size of the fold. In children the first stitch is to be made over the middle of the abdominal ring, at other times, the stitches may be commenced where you please. If the abdominal ring be wide, and the other circumstances unfavourable for contraction and keeping up the rupture, it is then necessary to bring the stitches nearer, and to increase the size of the substances which are held together by the threads. In slight cases, and with quiet, intelligent patients, no bandaging is used; slight compression upon a thick layer of wool by means of a fitting truss, or a neckerchief fastened upon the hip, is always requisite, especially in children and restless patients, and in large ruptures which are with difficulty kept up. The threads may be removed from

(*a*) Journal des Connaissances Medico-chirurgicales, 1836, July.—Gazette Médicale, 1836.

Plachetsky, F., Ueber die Bonnet'sche Radical operation der Hernien nebst 8 Krankheitsfällen; in Beiträgen zur gesammten Natur und Heilwissenschaft herausgeg. von Wertenweber, vol. vi. pt. i.

(*b*) Sur la cure radicale des Hernies. Paris, 1836.

the sixth to the ninth day, and a truss must be worn for a shorter or longer time afterwards.

1159. Belmas (*a*) attempts to effect merely adhesive inflammation, by introducing goldbeater's-skin into the hernial sac, which he at first passed in, as an empty, dry bladder, by an incision through the sac, and then inflated it; but of late he has pursued the following plan:—After the rupture is completely returned, the sac and its coverings are to be raised with the fingers of the left hand in one fold, in front of and parallel with the spermatic cord, and through its middle, above the abdominal ring, a trocar-like instrument, divisible in the middle, is to be thrust. The operator now allows the hernial sac to slip from between his fingers, so that the fold is formed by the skin alone. An assistant holds this fold, and whilst the hernial sac is fixed by the thumb and forefinger, applied above and below the instrument, the latter is to be thrust forward till the union of the two canals corresponds to the interspace between the walls of the hernial sac. By the peculiar mechanism of the instrument the two canulas, after the removal of the trocar-points, are drawn asunder, and both walls of the hernial sac separated. The assistant lets go the fold of skin, grasps the canula corresponding to the trocar-point, whilst the operator holds the other canula, and through its aperture introduces with a probe four or five thin cylinders of jelly covered with goldbeater's-skin, in various directions, into the neck of the hernial sac. The canulas are then removed, and a truss is put on, the pad of which acts where the cylinders of jelly are placed, and is to be worn at least for four months, constantly. The patient may after the operation follow his business. The cylinders of jelly are soon absorbed. The goldbeater's-skin resists absorption longer, and excites slowly in the hernial sac an adhesive inflammation, which is confined to the parts in immediate connexion with the foreign bodies.

Walther's proposes to inject animal fluid, the patient's blood, into the hernial sac.

Upon the Radical Cure of Rupture, compare also

Ran, Dissert. de novo hernias inguinales curandi methodo. Berol., 1813.

Pfefferkorn, Diss. de herniis mobilibus radicitus sanandis. Landishut, 1819.

Pech, Osteosarcoma ejusque speciei insignis descriptio; adjuncta est de cura herniarum per ligaturam tractatiuncula. Wirceburg, 1819.

Hesselbach, A. K., Die Lehre von den Eingeweidebrüchen, vol. ii. p. 214.

Thierry, A., Des diverses méthodes opératoires pour la cure radicale des Hernies; Thèse de concours; avec des Planches. Paris, 1841.

1160. The decision as to the performance of the radical cure for reducible rupture in general, and on the different modes of treatment in particular, must be guided by the following circumstances. In consequence of the very greatly improved construction of trusses of late years, the necessity for the so called radical operation is, in comparison with former times, quite another thing, as thereby every reducible rupture can be retained in its proper place, and a cure often be effected by the proper wearing of a truss. All the modes of operation mentioned are more or less dangerous, especially cauterizing, tying, and stitching up the hernial sac, and the introduction of tents, as the inflammation thereby

(*a*) Recherches sur un moyen pour déterminer des inflammations adhesives dans les cavités séreuses. Paris, 1829.—Cliniques des hôpitaux de Paris. 21st Aug., and 11th Sept. 1839.—Révue Médicale. March, 1838.—von Walther, Ueber die Herniotomie als Mittel zur radicalen Heilung der Brüche; in Journal für Chirurgie und Augenheilkunde, vol. xxvi. pt. iii. p. 363. (Engraving of the instrument.)

excited quickly spreads over the whole of the *peritoneum* and the intestines. Therefore, also, many of the earlier adherents to this or that practice, have after unfortunate results, given them up entirely; and although some, for instance, KERN, have always observed fortunate results, and only one case terminate fatally, yet these assertions are too greatly opposed to the experience of others, to enable us to yield them entire belief. All the modes of treatment at the same time, in reference to their *permanent* consequences, are uncertain, and the statements of the cures are confined principally to immediately after the operation. Although the external abdominal ring and a part of the neck of the hernial sac be loosed, their remains (in external or oblique inguinal rupture) the opening of the internal abdominal ring into which the intestines again enter, and by gradual subsequent absorption of the effused plastic mass, and the thinning of the scar resulting therefrom, the rupture enlarges outwardly. In many cases, if the enlargement of the opening out of which the vessels of the testicles and thighs protrude, be the consequence of a bad, lymphatic constitution, apertures are formed in other parts of the belly, and if the rupture be kept up at one part, it will be seen to project at some other part. In gouty, otherwise healthy subjects, in a small rupture of not long continuance, if the sac be not thickened and not united to the neighbouring parts, the result may be at first favourable. Increased pressure, with the supine posture, is of all treatment the least dangerous, and may be attempted in all cases, although even herewith, severe inflammation and gangrene (MANGET, RICHTER) and even death (WILMER, SCHMÜCKER) have been observed. As to this mode of treatment, the methods of GERDY, BELMAS, and MAYOR, arranged according to their less danger. GERDY has up to the present time had the greatest success: I have, however, seen a recurrence of the disease, and according to BRESCHET (*a*), the results have in several instances been unfortunate. If, as in old ruptures where the sac adheres to the aponeurotic opening, (the abdominal and femoral ring), and consequently a mere inthrusting of the skin be not possible, the hernial sac be thrust in and held with loops, dangerous inflammation may easily occur; and this is still more likely to occur, if, as in BONNET's practice, be adopted. In this respect MAYOR's treatment is least attractive. I consider as some of the indications for the so-called radical cure those reducible ruptures, which even in the above mentioned supine posture, with the application of a truss, cannot be certainly kept up, especially in young persons, GERDY's or MAYOR's treatment is the most proper; but a truss must always be worn subsequently. The possibility of an unsuccessful, and the probability of a not permanent result must not be witheld from the patient's knowledge. The patient's wish to be cured *radically*, at all hazards, and to get rid of the use of the truss must not, according to the hitherto noticed results, determine the surgeon to operate.

Opinions in reference to the value of the radical operation for reducible rupture, are in modern times much divided, many rejecting it as dangerous and ineffectual, (BOYER, DUPUYTREN, LAWRENCE, and others,) and it has been attempted to be effected by continued pressure alone (RICHTER, LANGENBECK, ZANG). Few have allowed its general employment (KERN, VON GRAEFE). Some confine it to certain cases (SCHREGER, VON WALTHER, and others.) SCHREGER especially lays down

(*a*) Journal VON GRAEFE und VON WALTHER, vol. xxii. pt. iv. p. 657.

the following indications:—1. To remove certain local conditions and to render the application of a truss possible, for instance, in the complication of inguinal rupture with hydrocele, and indeed in a common hernial sac; in young subjects, with large ruptures, which cannot be properly kept in their place by any truss; in partial adhesions between the protruded parts and the hernial sac, or the testicle in congenital rupture. 2. In very fat or thin persons in whom the truss always shifts for the purpose of restricting by the operation, the protrusion of the rupture, and thereby to strengthen the effect of the truss. 3. When scarcely any truss will fit; for instance in lame persons, or if the testicle lie completely in the groin. 4 Questionable femoral ruptures, because in these there is little benefit from insecure application of the truss, and the danger being greater in existing strangulation. But in all these cases, the rupture can be kept up by the proper construction of the truss, and its application in the supine posture. If hydrocele exist at the same time, repeated puncturing answers the purpose better (*a*).

[English surgeons have rarely employed either of the methods proposed for the radical cure of ruptures, except the constant application of a truss, which, however, is admitted to be rarely successful, except in young persons and very recent ruptures. Astley Cooper removed the entire sac in a case of femoral rupture, and "passed stitches through its mouth, so as to bring the edges into perfect contact. * * * On the sixth day the ligatures came away, and the wound was healed on the tenth. A month afterwards I saw the woman," says he, "and was surprised to find that another *hernia* had formed on the same spot, which was already as large as that for which the operation was performed. * * * It appears, therefore, that the removal of the sac will not prevent a return of the disease; and, indeed, when it is recollected that the aperture from the *abdomen* continues of the same size after, as before the operation, and that the *peritoneum* will still remain the only obstacle to the descent of the intestine; it does not appear probable that this highly extensible membrane should succeed in preventing a return of the same *hernia*, the just formation of which it was unable to resist." (p. 62). Astley Cooper objects to the plan of making a ligature round the mouth of the hernial sac, not only that its object, gradually to cut away the sac, is inefficient, as shown in the preceding observation, but also because "it cannot even be securely done; for *first*, the spermatic cord is often divided by the sac, so that one part of it passes behind, and the other before, or on the side of the sac. When this happens it would be extremely difficult, if not impossible to conduct the operation in such manner as to avoid injuring parts which should never be touched. *Secondly*, this operation is founded on mistaken ideas of the hernial sac; for a ligature applied as proposed, at the abdominal ring, if it cut through the sac, must leave a *hernia* above it, with a sac still open as before; and the ligature cannot be employed to the part of the sac lying above the ring, without splitting up the tendon of the external oblique muscle, which would take off so much of the natural support of the parts, as almost certainly to allow of a future descent. *Thirdly*, the danger of the operation is a principal objection. A ligature applied around a part of the *peritoneum* must inflame it; and as this membrane is continued without interruption along the sac into the cavity of the *abdomen*, the inflammation will follow the same course, and expose the patient's life to hazard." (p. 62). In support of this latter objection, Cooper refers to Petit's (*b*) experience. I opened the tumour," says the latter, "and replaced the *omentum*; I then detached the sac, and tied it as I had seen done, and dressed my patient. In two hours time I was much surprised at receiving a message that he felt great pain over the whole belly, and severe gripings. I hastened to the patient, fancying that the intestine might have slipped into the ring and become strangulated; but when the dressings were taken off, and nothing was found in the wound, I concluded that the mischief had been caused by tying the sac. I cut the ligature and removed it, and dressed the parts simply; the symptoms were immediately relieved, and ceased entirely in an hour. This is not the only observation I have made on the subject; all I have seen has confirmed me in the opinion, that the ligature of the sac, or in other terms, of the *peritoneum*, since the sac is formed by that membrane, may bring on symptoms very like those caused by stangulation of the intestine. I cannot doubt that those whom I

(*a*) Compare Hesselbach, p. 245; Jacobson, p. 77; Sigmund; in Hufeland's Journal, vol. ii. March, 1841.

(*b*) Traité des Maladies Chirurgicales,

have seen perish after the employment of the *punctum aureum*, have died from inflammation of the belly, caused by tying the sac." (p. 339).

Lawrence also comes to the same conclusion in regard to the proposed operations for the radical cure of ruptures.—"I cannot believe," says he, "that any one of the methods now under consideration is calculated to attain the proposed object. Why does the rupture return after the operation? Because the ring has been enlarged by the previous protrusion, and is still further weakened by the incision necessary for removing the stricture, This state of the tendinous openings would not be altered by closing the mouth of the sac, even if we could accomplish that object. We must reject the ligature on account of the danger inseparable from its employment, and we have no sufficient reason for placing confidence in scarification of the sac or in its removal by dissection. In many instances these latter methods would be neither easy nor free from danger. Hence we account for the circumstance that all these various methods have become completely obsolete." (p. 321.)]

1161. The *treatment* of *strangulated rupture* must be directed according to the different character and severity of the symptoms; in reference to which, suitable remedies must be employed with due circumspection and choice; too violent attempts, and especially too frequent changes, and again, new experiments which have in so great number been proposed and boasted of, are to be avoided. But too frequent is the course of strangulation hastened by improper treatment, and the patient's condition rendered worse. The more acute the inflammation the more dangerous is it.

1162. Inflammatory strangulation requires blood-letting, especially if the symptoms be severe, if the patient be strong, the rupture and the belly very painful. Small pulse, cold limbs, pale countenance, must not prevent blood-letting, as these are the peculiar symptoms of violent inflammation of the belly. The earlier bleeding is performed, and the more blood is taken at once, even till fainting is produced, the better is its effect. Leeches may also be applied about the region of the rupture, and because they usually here produce an erysipelatous inflammation of the skin, they may be applied about the *rectum*, (Birago,) (*a*) and cold fomentations, at the same time upon the hernial sac or cold sprinklings to the rupture. If the rupture be very tense and painful to the touch, it must be attempted by these means first to produce a favourable change, general and local relaxation, before the *taxis* is employed, which must be done in the most dexterous manner, according to the above-described rules. If the rupture be less painful we may commence the treatment with the *taxis*, and if this be not successful, the above treatment must precede subsequent attempts with the *taxis*. All internal remedies, especially purging, are in this strangulation hurtful; even calomel, which has been recommended by many, (Rust, Seiler, and others,) I have always noticed as having only an injurious effect. The patient must merely take mild drinks, for example, almond, milk, gum water, and the like, in small quantities. Clysters in severe inflammation, merely soothing, with the addition of castor oil, and in diminished inflammation, of infusion of tobacco or tobacco juice, are extremely efficient.

Tobacco clysters are not to be considered as irritants, but as narcotics, and the employment of *belladonna* or *hyoscyamus* are similarly circumstanced, only the ope-

(*a*) Compendio di Osservazioni cliniche sul vantaggio delle Mignate applicate all' Ano nelle ernie inguinale et addominali incarcerate, e sulla potassa caustica applicata in diverse malattie di carattere linfatico. Milano, 1821. 8vo.

ration of the tobacco is less dangerous; from it ensue a disposition to *nausea*, to fall down, faintness, slow pulse, and diminution of the tension of the rupture. The effect of the tobacco juice and infusion is similar, but the tobacco-juice clysters are very troublesome, the necessary preparations for which are not always at hand. For the infusion, from half a drachm to a drachm of tobacco is used in from twelve to sixteen ounces of water, for two clysters. When injurious effects have been observed, the quantity of tobacco was too large.

[Tobacco clysters are very uncertain, and have been occasionally very dangerous remedies; as the strength of the infusion varies considerably according to the freshness and goodness of the tobacco leaves, of which it is scarcely possible to judge. The use of tobacco clysters, which was formerly much urged by Astley Cooper in cases of strangulated rupture, is now much less practised than formerly; indeed I have not known it used at St.Thomas's either by my colleagues or myself for many years. We prefer, in the event of the failure of the *taxis*, after warm bath and quick full, bleeding, at once to resort to the operation, considering it the most safe practice.—J. F. S.]

1163. If the symptoms be less severe, and if complicated with spasm, warm bathing, rubbing in volatile ointments, with opium or oil of henbane upon the belly, tobacco clysters, cold applications upon the rupture, and in powerful persons, a large bleeding in a very hot bath, are most efficient remedies, after which sudden relaxation follows, and the reduction is effected. Here also internal remedies are ordinarily hurtful, as they increase or excite vomiting, as purgatives, with whatever addition, ipecacuanha in repeated doses, and so on. A simple emulsion with *aqua laurocerasi* is, among these, the most proper. The *taxis* must here also be at first attempted, and if it do not succeed, must be repeated after the remedies mentioned.

1164. In *Chronic Strangulation*, when, from collection of stools, but without any inflammatory symptoms or vomiting, or when these, though rarely, are present, stimulating clysters of vinegar and water, soap and water, solution of salts with castor oil, solution of tartar emetic, infusion of senna, tobacco clysters, cold applications upon the rupture, and internally purgatives, in very chronic cases calomel alone, or with opium and colocynth extract, (A. Cooper), even with jalap or croton oil, (von Walther), have been directed. But when vomiting has set in, the latter remedies always render the patient's condition worse. With the *taxis* it must always be attempted to compress the rupture, in order to return part of the collected stool. When inflammatory symptoms have come on, the above-mentioned treatment must be employed in correspondence with circumstances.

1165. The *taxis* must be employed in strangulated, in the same way as in reducible rupture. The patient after having emptied his bladder, must lie in such posture that the seat of rupture be raised, and the walls of the belly properly relaxed; in inguinal and femoral ruptures with the rump raised, the chest bent slightly forwards, and the thighs drawn up towards the belly, but not separated from each other. The practitioner stands on the right side of the patient, grasps the hernial swelling with the fingers of his right hand, and places the fingers of the left in the region of the mouth of the sac, and endeavours, by alternately pressing the rupture together, and in the direction of its escape, to press it back into the belly. In small, for instance, femoral and umbilical ruptures, the fingers of both hands may be applied around the swelling to compress and return it. Herewith the rupture must be carefully

moved from one side to the other, kneaded between the fingers, and the pressure only gradually increased. Violent pressure is to be avoided, because severe pain, increased inflammation, and even rupture of the bowels or of the hernial sac may ensue, and the *taxis* must not be too long continued; but it must also be remembered, that without pain scarcely one strangulated rupture can be reduced. These manipulations may be continued for from a quarter to half an hour, and in chronic strangulation, even longer, and with greater force. We should endeavour to withdraw the patient's attention to some object, and forbid all effort and straining. If the *taxis* be unsuccessful, the patient must be left quiet in the same position, with the thighs supported in the hams; and it must be considered, according to the circumstance, what farther remedies are to be employed, and whether the attempts with the *taxis* should be repeated. Nothing is more injurious than excessive violence and rough handling. I have observed not unfrequently, that by keeping quiet, after the most careful attempts, at reduction have failed, the rupture returns either of its own accord, or with a slight assistance on the part of the patient.

1166. If the reduction succeed, the symptoms usually soon cease, and relief of the bowels ensues either of themselves or by the use of purgatives and clysters (1). If the inflammatory symptoms continue, they require corresponding treatment. The abdominal ring should always be examined with the finger, in order to ascertain that no part of the rupture remain in it, as may be the case, especially in external inguinal ruptures, in which I have several times observed, after a tolerably bulky, and in one case even very large rupture, had returned, and the external ring was free, that there was strangulation of a small portion of intestine at the inner ring, which rendered the operation necessary. But if under the treatment prescribed there be no satisfactory change in the rupture, but on the contrary, it become more hard and painful, the belly tense, and the vomiting more frequent, neither the use of other remedies, nor attempts with the *taxis* are to be persisted in, but the operation must be had recourse to.

The treatment proposed for strangulated rupture, in reference to the employment of remedies internally and externally, and of the *taxis* is very various. Although these several modes of treatment may be grounded on many good results, the above-described method must be considered most preferable, if it be employed with discretion and proper circumspection.

The position of the patient under the *taxis*, with his feet or knees upon a person's shoulders; the *vertical* position of the body, in order thereby to effect the return of the intestines through their proper tendons, and the application of ice poultices upon the rupture (Ribes) (*a*), with the *pelvis* raised and the head depressed; the posture upon the opposite side, with the thigh drawn up on the affected side (Hey); even the position on the knees and elbows. Continued pressure on the rupture with a weight or bladder of quicksilver of from two to five pounds; or by the patient's hand. Shaking the whole body by driving in a wheelbarrow (Preiss); injection of air into the *rectum*, and drawing it off with a clyster-pipe. The introduction of a thick elastic tube through the *rectum* into the sigmoid flexure of the colon, after O'Beiern's manner (*b*), who considers the collection of the intestinal gases, and the spasmodic closing of the *rectum* as the most common cause of strangulation. The application of dry cupping-glasses about the hernial swelling, or of a glass bell, out of which the air may be pumbed by some strokes of an air-pump, till the rupture is as high

(*a*) Gazette Médicale, July, 1833.
(*b*) Dublin Jour. of Medical Science, Sept. 1838.

again, after which it either returns of itself, or is easily reduced with the *taxis* (*a*). Clysters of *hyoscyamus* and *belladonna;* a mass of *belladonna* ointment smeared over the interior of the *rectum;* or a bougie smeared with extract of opium and of *hyoscyamus*, of each two grains, passed into the *urethra* (Ribieri, Guérin). Purgatives of all kinds; rubbing of croton oil on the belly; galvanism (*b*); clysters of lead wash (Nember, Rennerth, Preiss); tartar emetic (Church); muriate of morphia (Bell).

[(1) It is perfectly true, that in general after reduction the symptoms of strangulation subside; but now and then they do not, which may depend upon the damaged condition of the bowel, or simply on the existence of *peritonitis*. Instances of the latter are not very uncommon, and can scarcely be distinguished from the symptoms of strangulation, except by the absence of the hernial swelling. Of the former I had an example under my care in 1840, which was a source of great anxiety, and terminated fatally.

Case.—J. S., aged seventeen years, ruptured himself on the right side whilst lifting hampers into a cart in the afternoon of

Nov. 30, and immediately observed in the *scrotum* a swelling as large and as long as his thumb. Half an hour after he began to vomit, and continued to do so through the night. On the following morning the *taxis* was unsuccessfully employed, and afterwards a few leeches; some medicine was given, which was rejected; he continued vomiting during the day, had not any relief from the bowels, and suffered pain in his belly. Next morning the rupture was reduced and a truss applied, but removed two hours after, as it was too large. During the day he was relieved of the pain, but vomiting occurred five or six times, and especially on attempting to take any thing into his stomach. Towards 8 p. m. the swelling reappeared, about half the former size; the vomiting became more frequent, and the pain in his belly increased.

Dec. 3, 2 a. m.—He was bled nearly to fainting, and the rupture returned; a cold mixture in a bladder was applied (for what reason did not appear) to the region of the swelling, and replaced continually as it became warm. The vomiting, constipation, and pain continuing, he was brought to the hospital at

½ *past* 3 p. m.—He was immediately put in the warm bath, where I examined him, but even when standing up could only observe a slight fulness in the right groin, probably from the leeches, and very deeply a small indistinct swelling not exceeding the size of a small bean, between the abdominal rings; it neither dilated on coughing, nor yielded to pressure. I could pass my finger readily into the external ring. His belly was full and and tympanitic, and he complained of pain and tenderness specially about the hypogastric region. The pulse was small and quick; but he had not any anxiety of countenance. I could not feel satisfied of the existence of a rupture, and therefore ordered five grains of calomel and an injection of infusion of senna and salts, which was retained; but an injection of castor oil in the course of the evening returned immediately.

11 p. m. I made another careful examination, in consultation with my friend Callaway, and I thought I felt a slight gurgling, but very doubtful; it could not be felt again, and we both were satisfied that the swelling was merely the spermatic cord. We therefore ordered a grain of calomel, and half a grain of opium, every hour, with a castor-oil injection immediately; and thirty leeches to the belly, with subsequent fomentations, considering his attack to be peritoneal and enteritic.

Dec. 4. The bowels continued obstinately costive throughout the whole day, except a very small quantity of thin watery stool once in the afternoon, and again in the evening, although injections were thrice thrown up. The vomiting did not recur, but he felt nauseated, and the tenderness, and tympany of the belly increased. When I saw him at nine in the evening, his tongue was much loaded, and the gums reddened, but without soreness or mercurial smell. The little enlargement in the inguinal canal still remaining, I fancied I again felt a slight gurgle, but it ceased almost immediately. The calomel and opium were ordered every three hours; half a drop of croton oil directly, and to be repeated two hours hence, if requisite; thirty leeches to the belly, and fomentation. I had scarcely left him when he vomited about a pint of dark-green and very fetid fluid. The croton oil was taken at ½ *past*

(*a*) Huaf, De usu Antliæ pneumaticæ in arte medicâ. Gardæ, 1818.—Köhler; in Hecker's lit. Annalen, 1835, April.

(*b*) Archives Générales de Médecine. 1836.

10 P. M., and after an hour producing only a small thin motion, the second dose was given. Two hours after, his bowels acted again, and he again began to vomit, and vomited and passed thin, but more fæculent motions five or six times before

Dec. 5, 7 A. M. when he became quiet, and two hours after took some bread and milk, which he retained till

11 A. M., and then rejected; his countenance is now much shrunk and flushed, but he is cheerful, and wishes something to eat: pulse 100, and small. He has much pain in the belly, but it is less distended. An hour after he had another loose motion.

2. P. M. In consultation with my friends GREEN and CALLAWAY, we were satisfied that no intestine was down, and the slight fulness already mentioned had entirely disappeared. The calomel and opium which had been withheld at the last period, was ordered to be resumed, and a mustard poultice applied over the belly. Soon after the application of the poultice, vomiting of thin, yellow, acid-smelling fluid recurred, and continued frequently till evening, when I ordered him effervescing mixture, with large excess of alkali, but without benefit, and the vomiting continued through the whole night and following day, not being at all checked by two minim doses of hydrocyanic acid, with compound spirits of ammonia, every six hours. As his mouth was untouched by the calomel, I ordered on the morning of this day,

Dec. 6, that he should rub in a drachm of mercurial ointment, with five grains of camphor, every four hours; a large blister over the whole belly, and a colcynth injection.

8 P. M. No motion since noon yesterday; the vomiting continues, and he is much sunk. To take a grain of solid opium every six hours, and have some brandy and arrow-root.

Dec. 7, 4 P. M. He died, having continued to vomit since the last report, and not having had any relief from the bowels.

Examination.—After raising the tendon of the external oblique muscle from the inguinal canal, the edge of the internal oblique was seen uplifted by a small dark-coloured tumour about the size of a hazel nut, which was evidently a hernial sac and contained dark-coloured fluid. The internal oblique and the transverse muscles were then carefully divided up to the internal ring, to which the sac was easily traced, and the latter having been carefully opened about its middle, about a drachm of *serum* escaped. The sac was cut up to the internal ring, through which a very small knuckle of dark-coloured but shining intestine protruded. The belly was next opened; it contained no fluid, and little appearance of inflammation, except a thin film of adhesive matter slightly gluing together the intestines in the right iliac pit. The abdominal muscles having been completely turned down, about eight inches of very dark-coloured yellowish green intestines were exposed, distended immediately above the portion of gut in the mouth of the sac, with thin fæculent matter like his last stool; an inch of the bowel below the sac's mouth was of the same dark colour, and suddenly terminated by a distinct mark of strangulation, upon which, beneath the *peritoneum*, fibrin had been poured out. Below this point the gut was healthy but contracted. The portion of intestine in the sac was about two-thirds of its tube, the part nearest the mesentery, being quite above the internal ring. In examining further, this protruded piece of gut dropped out, and there was not found upon *it* the slightest mark or appearance of strangulation.

From this examination, I presume, that the strangulated bowel had been returned by the medical man who last saw him; that the strangulation had been sufficiently long to destroy the vitality of the intestine, which had therefore never recovered itself; that the portion of intestine found in the mouth of the sac, had been forced in by the vomiting but that *it* had never been strangulated nor incarcerated, nor had probably been there constantly, through the course of the disease, though it might have been occasionally, by the effort of vomiting; and that the costiveness depended not on the tube of the bowel being impervious, but on its death having destroyed its functions, and that the stools passed were merely forced by their quantity through the dead intestine.—J. F. S.]

1167. The decision as to the proper time for the operation, especially depends on the kind of strangulation, on its severity and duration, on the constitution of the patient, and on the effects which the previous

remedies had produced (1). In inflammatory strangulation, in small ruptures, which arise suddenly from external violence, or in those where the strangulation is at the mouth of the sac, (*par.* 1135), in young vigorous persons, the operation must not be delayed; if by the preceding treatment reduction have not been effected, or if the painfulness of the rupture will permit no further attempt at reduction. It is often necessary within the first eight or twelve hours. In such cases can the advice of KERN and WATTMANN be alone applicable, not uselessly to waste time by attempting relief with external and internal remedies, but immediately to employ the only helpful remedy; to wit, cutting into the rupture. In spasmodic and chronic strangulation, the operation may be delayed; very frequently repeated attempts at reduction should, however, be avoided, and after the most powerful remedies have been employed, it is better to resort earlier to the operation, than by further delaying it to put the patient's life in greater danger. But the operation is in these cases specially indicated, if an inflammatory condition be superadded, especially in old persons. In general, the longer the operation is delayed, the more unsatisfactory is the *prognosis*, as the danger is less from the operation itself, if properly conducted, than from the degree of inflammation and the circumstances thereon depending.

[(1) The invariable rule in all cases of rupture in which symptoms of strangulation exist, be they slight or severe, if the *taxis*, after warm bath and bleeding have been unsuccessful, is without loss of time to proceed to the operation, as the most safe for the patient. For the damaged state of the intestine is frequently not indicated by corresponding severity of symptoms, as is well known to every one who has often operated in strangulated rupture. Every hour, therefore, which defers the operation adds to the patient's danger; on which account we cannot operate too early, when satisfied that strangulation cannot be relieved without.

Occasionally it happens that patients will not submit to an operation for strangulated rupture, and nothing then remains but to persist in the employment of one or other of these remedies which have been proposed. The tobacco clyster is now therefore permissible, and should be resorted to, and the continued application of ice poultice (ice roughly pounded or a freezing mixture, consisting of hydrochlorate of ammonia and nitrate of potash, five ounces of each with a pint of water), in a bladder upon the swelling, which sometimes succeeds; but the condition of the skin should be attended to during its use, as it may become frost-bitten, and though the rupture may be reduced, the skin may slough, which happened to a patient of the elder CLINE. Sometimes the patient having withheld his consent for many hours, being at last worn out by the vomiting, will submit to an operation; the question then comes, should it be performed under unfavourable circumstances? I think it should; for, without an operation, he must certainly die, and with it he has a chance, however slight, of recovery. Indeed I think the operation for strangulated rupture should always be performed, if the patient be not *in articulo mortis*.—J. F. S.]

On Strangulated Rupture in particular, the following writers may be consulted:—

ZIMMERMANN, Beobachtungen der beruhmtesten Wundärzte neuerer Zeit zur Erläuterung der sichersten Behandlungsarten eingeklemmter Brüche. Leipzig, 1832. folio.

STEPHENS, Treatise on Obstructed and Inflamed Hernia. London, 1829.

RUST. Ueber die rationelle Behandlung eingeklemmter Brüche; in his Magazin, vol. xxix. pt. ii.

SINGOVITZ, Anleitung zu einer zweckmässigen Manualhülfe bei eingeklemmten Leisten und Schenkelbrüchen. Danzig, 1830.

1168. The operation for strangulated rupture proceeds by the following steps:—*first*, The incision of the skin; *second*, The exposure and opening of the sac: *third*, The dilatation of the neck of the sac or of the abdominal ring; *fourth*, The return of the intestine.

Previously to the operation, the urinary bladder should be emptied, the seat of the rupture if hairy, shaved, and the patient so placed on a narrow table, covered with a mattress, that the rump and chest be raised, and the belly properly relaxed; or so upon the edge of the table, that the feet may rest on and be supported by a stool.

1169. The skin above the hernial swelling is to be raised into a transverse fold, the one end of which is given to an assistant, and cut through with a bistoury (1). By means of a grooved director introduced into the angle of the wound, the incision is to be enlarged upwards and downwards, so that it extend beyond the swelling in both directions (2), if the tension of the skin do not permit the formation of a fold, the incision must be made freely, the skin being drawn aside by the thumb and forefinger of the left hand. As there are ruptures without sacs, or as the sac may be torn, the incision through the skin must be cautiously made, and the director used as much as possible.

[(1) Lifting up a fold of skin over the rupture, and either cutting through it, as here recommended, or piercing it with a bistoury, and cutting out, is, I think, bad and dangerous practice; for it cannot always be ascertained what the thickness of the coverings of the sac are, or indeed whether there be any other than the skin, and and therefore, in not very dextrous hands the sac may be opened at once, and the gut injured. This mode of commencing the operation may seem smart and flashy, but it is dangerous and improper, and entirely devoid of any good reason for its performance.

(2) In inguinal, or rather in scrotal rupture, it is better that the cut made lengthways, should not extend below the bottom of the tumour; it should terminate an inch above it, as room in the operation is not wanted there. The cut should extend above the swelling, otherwise the stricture is so inconveniently deep, that it will commonly be necessary to enlarge the external wound after the sac has been opened, and before the division of the stricture can be made.

In femoral, umbilical, and other ruptures, it is not needful to extend the cut beyond the swelling, because the flaps usually made either by the ⊥ or crucial cut, afford ample space for the continuance of the operation.—J. F. S.]

1170. The exposure of the sac requires care, as the coverings are very different, and in old ruptures considerably degenerated. At the part where protected from any other injury, or where fluctuation is most distinct from the fluid contained in the sac, the coverings must be taken hold of with a pair of forceps, raised up in a heap, and divided with the bistoury held flat (1); this is to be repeated till the sac is laid bare, which is known by its shining surface (2). The blood flowing from these cuts must be carefully absorbed with a sponge. The hernial sac itself should be raised in a similar manner, and cut into, from this opening a little fluid usually escapes; for though the *omentum* be fallen over the surface of the intestine, the shinyness and smoothness of the sac show the practitioner that he has penetrated its cavity (3). The edge of this opening is to be raised with the forceps, and enlarged with blunt-ended scissors, till a finger can be introduced into it, upon which the scissors (4), or button-ended bistoury, should be introduced, and the opening of the sac increased upwards and outwards throughout its whole length (5). If on opening the hernial sac, an adherent part be lighted on, the opening must be enlarged at some other part, till the finger can be introduced, to destroy the adhesion, if it be gelatinous, or if membranous, to divide it with the knife. In firmer fleshy adhesions, we must proceed as will be hereafter mentioned (6).

If after these appearances, it be doubted whether the sac be opened or not, the swelling is to be pinched up with the thumb and forefinger into a fold, and that held between them gradually allowed to escape, when it is distinctly felt whether there be merely intestine or the hernial sac also.

[(1) In dividing the coverings of the sac, I prefer, after the skin has been completely cut through, scratching with the end of the probe or director, till a layer of the cellular tissue be penetrated, and then introducing the director and dividing upon it; after which a second and other layers are to be divided in similar way, even to the opening of the sac itself. This is much safer than nipping up with the forceps and opening with the knife laid horizontally, which, however, cautiously used, may, in opening the sac itself, risk the puncture of the intestine; an accident which once occurred to myself when I was a young operator.

(2) The hernial sac cannot always be distinguished by its shining appearance, for occasionally it is thick and opaque, especially after long wearing a truss; and I have again and again seen the sac opened when the surgeon supposed he was far from having reached it. Also if, as in rare cases it happen that the sac and its contents be glued together more or less completely, this distinction does not hold.

(3) The most certain proof of the sac being opened, is the escape of the fluid in greater or less quantity contained in it, which is proportioned generally to the length of time the patient has had the rupture, and also of the existence of strangulation. It is a most satisfactory indication of the course of the operation, but the surgeon must not expect always to have it. During the course of the last few months I had a case of strangulated rupture, in which not a drop of fluid escaped when the sac was opened.

The colour of the fluid escaping, when the sac is cut into, varies considerably; sometimes it is almost colourless, sometimes red as blood, and Callaway told me of an instance in which even a clot of blood was found in the sac; the case, however, did well.

(4) I prefer the director and knife to the scissors, and throw aside even the director immediately the aperture is sufficiently large to admit the finger, which is always the best guide for the knife, and the greatest protection to the contents of the sac.

(5) There is no need, as already mentioned in regard to the external wound, to open the sac down to its bottom; but it *must* be divided up to the stricture.

(6) Whenever an artery is disposed to bleed, if divided whilst cutting through the several coverings, it is better at once to tie it, as the bleeding often causes confusion.—J. F. S.]

1171. In many cases, when the strangulation is not considerable, or depends on the peculiar position of the intestines, their entanglement, or their circular enclosure by the *omentum*, the protruded parts may be returned when they are properly untwisted; or when the part of the intestine at the seat of strangulation has been a little drawn out, and by a gentle pressure, it has been attempted to return the contents of the bowel into the belly. If the intestine be strangulated in a fold of the *omentum*, this must be freed with the bistoury, if the intestine cannot easily be drawn out of it.

[In the College Museum is a very remarkable instance of strangulation of a small intestine, by a smooth round cord, two and a half inches long, and about a line thick, extending from the end of a *diverticulum* on the *ileum* to the mysentery, about an inch and a half from the edge of the intestine. In St. Bartholomew's Museum there is a similar case of *diverticulum* from the small intestine to the mesentery, forming a circular hole, in which the gut is strangulated. The patient was subject of obstinate costiveness, and died in four days. In St. Thomas's Museum there is an instance of strangulation of small intestine by a band from the ascending *colon* to the mesentery. And at St. Bartholomew's a preparation of the small intestines of achild of seven years old, strangulated by a narrow thread-like band from the mesentery; he was admitted for constipation, and died fourteen days after.—J. F. S.]

1172. If reduction cannot be thus effected, the seat of strangulation must be dilated, which may be done either by *cutting* or by *stretching*.

1173. *Dilatation by cutting* is effected in the following way:—The intestine is to be withdrawn in the most careful manner by an assistant, from the place where the cut is to be made; the sac should be drawn somewhat outwards with the thumb and forefinger of the right hand, and the tip of the left forefinger is to be introduced between the intestine and the neck of the sac; a straight or curved narrow bistoury, with a blunt end, should be introduced flat upon this finger, its cutting edge directed towards the place where the cut is to be made, and the seat of strangulation cut into by raising the handle of the knife, or by pressing its edge up with the finger of the left hand; but if the strangulation be so great that the finger cannot be introduced, after drawing down the neck of the sac, a director, curved according to circumstances, and oiled, is to be introduced between the intestine and the seat of strangulation, its groove turned towards the part where the incision is to be made, its handle so held with the fingers of the left hand, that they separate the intestines from the director, and give it such position, that its point rests against the inner surface of the *peritoneum;* and then upon its groove the button-ended bistoury should be introduced. If the seat of strangulation be deep, it is more safe to draw the intestines a little down, so as to be able to see the seat itself. The direction of the cut should always be such as to prevent serious injury; and its size such that the forefinger may, without violence, be introduced at the part where the stricture was situated. It is then to be ascertained by the introduction of the finger into the belly, whether any second strangulation exist which requires a second dilatation.

There are peculiar instruments for dividing the strangulating part. Petit's straight and curved fork director; Mery's and Monrenheim's winged director; the *straight* bistoury, with a button or probe end of Petit, Bellocq, Brambilla, Dzondi, the *convex* one of Le Blanc, Brambilla, Dupuytren, Seiler; the *concave* of Perret, Heister, Arnaud, Richter, Rudtorffer, Astley Cooper, Langenbeck, and others, merely a modification of Pott's bistoury, the *concealed* bistoury of Bienaise, Le Blanc, and Le Cat.

[In the divison of the stricture, the use of the finger, as a guide for the introduction of the blunt-ended bistoury, is far as preferable to the director; and being sure that it is by far the safest, I rarely use any other, however tight the stricture may be. If the finger can fairly reach the stricture, and the smallest part of its tip can be introduced, a very little gentle thrusting will make room for the entrance of the point of the knife. In inguinal rupture I do not recollect to have used a director more than two or three times, and but little more frequently in femoral. The director is a very unsafe instrument, where out of sight, for however carefully the intestine may be tended, it will occasionally turn over the director, and be cut in dividing the stricture, which I have seen happen once or twice. When it is absolutely necessary to use the director, in consequence of the impossibility of getting the tip of the finger into the stricture, I have protected the intestine by introducing a spantula between it and the director up to the very stricture. But when this difficulty occurs, it is advisable to lengthen the cut upwards through the skin and coverings of the sac, till the stricture is brought completely and distinctly into view, and then to introduce the director.—J. F. S.]

1174. The *bloodless dilatation*, or that *without cutting*, which is only applicable in those cases where serious injuries, not well to be avoided, forbid incision, may be effected either by the introduction of the finger, or with a proper dilating instrument, (Le Blanc's dilator,) or with a small hook, (Le Cat's S-shaped hook and Arnaud's hook;) which is to be carefully introduced between the intestine and the seat of stricture,

and therewith extension made, sufficient to render the reduction possible. Bruising of the intestine is scarcely to be avoided.

The bloodless dilatation, first proposed by THEVENIN (*a*), was particularly recommended by LE BLANC (*b*); but although LE CAT, ARNAUD, RICHTER, even SCARPA, and others have conditionally declared for it, in recent times it has been almost entirely rejected, and only applied, by some, (TRUSTEDT, RUST, SEILER,) to femoral rupture, especially, and in a manner to be hereafter described.

[I know no circumstances in which dilatation without the knife is permissible. I should consider any forcible expansion of the stricture, by pulling or dragging with instruments, dangerous and unwarrantable, as it would be ineffectual for the required purpose without more mischief than would result from using the knife.—J. F. S.]

1175. When the obstruction to the return of the intestines on the part of the neck of the sac, or of the abdominal ring has been removed, it depends on the state of the parts contained in the rupture how their return shall be effected. This is often at once possible, without any difficulty; often must the intestine be carefully unfolded, if filled with stool or air (1). That part of the intestine at the seat of strangulation should always be drawn a little down, to examine its condition. The reduction should be effected with the fingers wetted, those parts first protruded, being carefully first returned; thus the mesentery earlier than the intestine, and that before the *omentum*, according to the direction of the aperture through which they have protruded. The forefinger is then to be passed by this opening into the belly, for the purpose of determining that all the parts are returned (2).

[(1) Always before the intestine is attempted to be returned it should be emptied by gentle pressure of its contents, whether air or stool, which renders the reduction easy; whilst if this be not attended to, considerable difficulty is often experienced. Not unfrequently after dividing the stricture, the tonic power of the muscular coat of the bowel will itself empty its contents; or if they be fluid, they will flow back into the intestine canal, the protruded gut become flaccid and be readily returned into the belly. I do not at all consent to the practice of pricking or cutting into the intestine, if it be indisposed to return, on account of its distension with air. I am sure that after dividing the stricture freely, it is not matter of much consequence whether the gut be returned or not by the operator, as most commonly after a short time the air passes along the freed gut, and the protruded part diminishes in size, and if not restrained by adhesions retracts into the belly.

(2) Although there may be little fluid in the sac, yet it is not unfrequent to have it pour forth freely from the cavity of the belly after the protruded parts have been returned. I recollect having a case in which blood-red fluid escaped so largely that I almost feared I had divided some vessel; however, it ceased before the patient was removed from the table. CALLAWAY tells me of an instance in which, after the return of the intestine, a large quantity of honey-like fluid poured forth, he presumes from an ovarian dropsy having been wounded: the patient, however, recovered.—J. F. S.]

1176. The reduction of the intestine may be rendered difficult or impossible—

1. By *adhesions*,
2. By *disorganization*,
3. By *gangrenous destruction*.

1177. If the connexion of the parts with each other depend on a gelatinous substance, it can be easily destroyed with the finger. Filamentous adhesions having been made tense, may be divided with the knife, the edge of which is to be turned towards the hernial sac, rather than towards

(*a*) Traité des Opérations. Paris, 1696.
(*b*) Precis d'Opérations. Paris, 1775, vol. ii. chap. vii.

the intestine. But if there be a fleshy adhesion between the sac and its contents, the practice is different, according as the adhesion is between the *omentum* and the hernial sac, or between the *omentum* and the intestine. In the former case the *omentum* must be divided, as near as possible to the adhesion, with the knife or with the scissors. If the *omentum* adhere to a considerable extent to the sac, it must only be divided at the neck of the sac, surrounded with some linen overspread with cerate, and when the inflammation has subsided, it should be divided near the abdominal ring. (According to SCARPA, it should be tied and tightened daily till it fall off.) The *omentum* often returns into the belly whilst surrounded with the linen (1). In the second case, after the strangulation is relieved, the intestine must be left quiet in its place, covered with compresses moistened in and often wetted with decoction of marsh-mallows (2). It is frequently observed that the piece of intestine gradually returns into the belly. If it remain partially in the abdominal ring, it becomes covered with granulations and adheres to the integument. The same practice must be pursued in the *natural* connexions between the intestine and the hernial sac, when they render reduction impossible.

If the intestine be so considerably distended with stool and air that reduction is rendered difficult, it must be attempted, after *sufficiently* cutting into the constricting parts and after the intestine has been somewhat drawn down, by gentle kneading, and pressing together, to return partially the contents of the bowel, and to diminish the size of the intestine. In such cases the overfilled intestine has been punctured with a large needle. (LOWE,) with a lancet, (LOEFFLER,) and with the trocar (RICHERAND, JONAS, VON GRAEFE); the latter was successful, and at the same time a loop of the mesentery (*a*) was applied (3).

[(1) If the adhesions between the *omentum* and sac be old and membranous, and easily divided, it is advisable to do so, and to return the *omentum*. But more frequently the adhesions are too short to admit of this; or the surface of the *omentum* is actually glued to, and so consolidated with, the surface of the sac, that it cannot be set free without cutting through. I have had two cases of this kind, in which, having returned the gut, after freely dividing the stricture, I have left the adhering *omentum* undisturbed, and no ill consequences have ensued. But there is a preparation in St. Thomas's Museum, where this practice was pursued, and the gut, after division of the stricture, returned into the belly, yet the symptoms of strangulation continued, and the patient died; and, on examination, it was found that the *omentum* formed a tight cord upon the intestine as it lay transversely behind it, on the brim of the *pelvis*, and completely prevented the passage of the contents of the bowel through it. I do not, therefore, feel certain as to which is the best practice in such cases; but I may state, that my cases which were successful happened after the fatal case just mentioned. I certainly should not be disposed to adopt or recommend the practice proposed by CHELIUS, of separating the adhesions at the neck of the sac, and passing a piece of linen round the *omentum*, with the purpose of dividing it at a future time, as I should expect that the presence of such extraneous substance would be likely to excite dangerous inflammation.

(2) As to the adhesions between the *omentum* and gut, if they cannot be easily separated with the finger, they are best left alone, without attempting further separation or their return, to take their chance together, either to remain in the sac, or return of their own accord into the belly.

(3) There is in the Museum of the Royal College of surgeons of England, a preparation of a portion of strangulated small intestine, which not being returnable on account of the great quantity of air it contained, was cut into, to the extent of an inch, and left in the sac, and the patient died. I cannot imagine there is any necessity for puncturing the intestine to compel its return into the belly, provided the stricture be freely divided; for I know by experience, that if strangulation be relieved,

(*a*) Journal VON GRAEFE und WALTHER, vol. iii. p. 255.

it is of little consequence how much intestine be down. In reference to this point, I recollect the largest scrotal rupture on which I have operated, and in which, before the division of the stricture, there was at least half a yard of bowel down, filled with air; and, after the stricture had been cut through, at least as much more thrust through, so that I almost despaired of getting any back: yet after a time I returned the whole. To my vexation, however, next morning I found my patient had got out of bed to relieve himself on the chamber-pot, and as might be expected, the bowel had descended, and in such quantity, that the *omentum* was at least as big as a quart pot, and the vermicular motion of the intestine was distinctly seen through the stretched skin. Nothing further was done than to keep the tumour raised above the level of the abdominal ring, by placing a pillow beneath it, and by degrees it returned, and the patient never had an untoward symptom.

If, however, the bowel be filled with solid matter, as hard stool, or apple or potato skin, and its return thus prevented, as well as the passage through it stopped up, an instance of which latter kind is in the College Museum, then the loaded gut ought to be cut into freely without hesitation, as the only means of perhaps saving the patient's life. But such cases I suspect are exceedingly rare.—J. F. S.]

1178. If the *omentum* be converted into a tangled lump, it must not be returned into the belly, because it requires a too large dilatation of the abdominal ring, and this degenerated mass may produce inflammation and even suppuration in the cavity of the belly. The general advice in these cases, is to tie the *omentum* above the degenerated part, to cut it off below the ligature, to return the tied part into the belly, and to fasten the threads externally. The ligature of the *omentum*, however, causes a new strangulation (1).

Experiments on animals, and numerous practices upon man, show that the *omentum*, cut off and without tying, may be returned into the belly without injury (2). But if the vessels of the cut edge of the *omentum* bleed they must be tied singly and the threads allowed to hang out externally, or torsion must be performed on them (3). The recommendation of allowing such diseased pieces of *omentum* to lie out, (Pouteau, Desault, Volpi, Zang, and others,) proves the objection, that by fastening the *omentum* in this position, severe disturbance of the stomach and so on may be produced. If the *omentum* be sloughy, the sloughy part must be removed with scissors, and treated in the way prescribed. In these cases, generally the *omentum* becomes adherent to the neck of the sac, which it then closes like a plug.

(1) I have tied the *omentum*, and cut off the part below the ligature several times, without any of the untoward results commonly, and as by Chelius, assigned to this practice.

(2) The largest portion of *omentum* I have known removed was seven ounces and a-half, in a case of scrotal rupture, in a man forty-two years of age, under Calaway's care: he recovered, and the preparation is in the Museum of Guy's Hospital.

Key (*a*) advises, that "the *omentum* should be unfolded before it is divided by the knife: otherwise the cutting off the *omentum* in a mass prevents all the vessels being seen, and when returned into the *abdomen* they bleed profusely. A case of this kind happened to him, in which he cut off "a large portion of *omentum* with one stroke of the knife, securing the bleeding arteries before returning it to the mouth of the sac. In four hours after the operation, blood of an arterial colour began to ooze from the sac, and soon increased in quantity to alarm the dresser. He used pressure and cold to no purpose. Her pulse began to falter, and her face was bedewed with a cold perspiration: and in this state I found her, when early on the following morning I was called to see her. It was evident she had lost a very large quantity of blood, and had she not been possessed of an unimpaired constitution, she

(*a*) Cooper's Hernia, above cited.

could not have supported the loss. I opened the sac, removed the *coagulum* with which it was filled, and was proceeding to look for the bleeding vessels of the *omentum*, when I fortunately observed the hæmorrhage had suddenly ceased. The only ill effect of the hæmorrhage was the disturbance of the adhesive process, and the consequent suppuration in the sac, as she ultimately perfectly recovered." (p. 43, *note.*)

When necessary to remove *omentum* I generally tear it off as far as possible, and afterwards cut through the part which will not tear. I have rarely had occasion to apply any ligatures.

Sometimes if the *omentum* be left, it sloughs; I have seen this happen two or three times without any inconvenience. Astley Cooper (*a*) mentions a case in which both *omentum* and intestine were returned into the belly, and after the operation the patient complained of severe pain in the belly; the ligatures on the wound in the *scrotum* were removed; on the following day a small portion of gangrenous *omentum* protruded, more and more gradually descended, till the whole which had been protruded appeared in the wound, sloughed, and the patient recovered. (p. 44.)

Hewett has recently (*b*) given a good account of some cases in which the *omentum* had formed a complete bag around the intestine in strangulated rupture. Although Richter has been stated to have had cases of this kind, yet it appears that he merely notices their existence without mentioning any particular instance, and Hey's cases cannot be admitted as belonging to this class. Hewett states that "these sacs have been found in the three most common forms of *hernia;* but it is in the umbilical *hernia* they have been generally observed; the relative situation of the intestine and the *omentum* in the abdominal cavity will easily explain the fact. Complete omental sacs were found in four cases out of thirty-four operations for strangulated *hernia*, performed at St. George's Hospital in 1842–43; of these four cases two were femoral, one inguinal, and one umbilical. The formation of these sacs is attributed by Richter to the firm agglutination of the margins of the *omentum* which has surrounded the bowel. In this explanation of Richter's which does not appear to be applicable to the majority of cases the two following explanations of the manner in which these sacs are in some cases formed have been added; —*First*, the gut, *completely enveloped* by the *omentum*, passes through the ring, and the *omentum* thus disposed round the intestine becomes attached to the circumference of the neck of the hernial sac; this omental pouch is subsequently distended by the intestine, and thus forms a complete lining to the hernial sac. *Second*, an *epiplocele* takes place, and the portion of *omentum* which is protruded becomes altered in structure, and its folds firmly united to each other by the effusion of lymph; but within the abdominal cavity, in the neighbourhood of the ring, the fold, into which the *omentum* has been drawn may not be agglutinated; they will thus leave spaces into which a knuckle of intestine may insinuate itself, pass through the rings and form for itself a bed in the altered mass of *omentum* which is in the hernial sac. It may happen that two or three portions of gut may slip into the different spaces left between the folds of the *omentum* and subsequently form for themselves separate pouches. Several separate sacs, with narrow-necks, may be thus found in the omental mass, which is in the hernial sac. Once formed, these sacs may attain an immense size. In one case the sac measured six inches in length, and eleven inches in circumference at its broadest part. The *omentum* in which a sac has been formed, may in the course of time, especially if it is irreducible, become altered in structure either by the effusion of lymph or by a deposition of fat, which takes place in the walls of the sac. By this alteration of structure the thickened sac may, in an operation, become the source of very great difficulties. * * * These omental sacs may either lie loose in the cavity of the hernial sac, or the two sacs may have contracted more or less extensive and firm adhesions with each other. (pp, 284–87.)

The neck of an omental sac may become the *sole* cause of strangulation, of which an instance is given. "The division of the neck of these omental sacs may be followed by hæmorrhage," of which he also mentions a case; the external bleeding at the operation was slight, and soon ceased; but after death a large patch of recently

(*a*) Above cited.

(*b*) Observations on the Omental Sacs which are sometimes found in Strangulated Herniæ completely enveloping the intestine; in Med.-Chir. Trans. vol. xxvii. 1844.

effused blood was found in the folds of the *omentum* near the mouth of the sac. (pp. 291, 92.)]

(3) If the blood have not coagulated in the vessels of the *omentum*, cutting it off and tying them singly is not only an almost interminable business, but also when apparently all the vessels have been secured, and the patient put to bed, after a few hours secondary bleeding occurs from some little vessel or vessels which had escaped notice, the sac and yielding skin become largely distended with blood, in such quantity as to produce faintness, and require the reopening of the wound to remove the blood and tie the bleeding vessels. This disturbance of the wound prevents the adhesive process, and very commonly gives rise to abscess in the sac or its immediate neighbourhood, by which the cure is much retarded. A case of this kind occurred to me, and a large abscess was the result, although the patient ultimately recovered. It is on this account I prefer tearing through the *omentum* as much as possible, by which the ends of the vessels are ensheathed in cellular tissue, and do not bleed, or even tying up the *omentum* together.

The occurrence of abscess in the sac, independent of bleeding, and which sometimes reproduces symptoms of strangulation, has been noticed by KEY, as will be presently seen (p. 309); first in a case which occurred at St. Thomas's Hospital in 1817, which I remember to have noted; and secondly, in a case of his own.—J. F. S.]

1179. If the intestine have a dark, violet, even dusky colour, and its warmth be diminished, these must not prevent its reduction; only, according to some, the precaution should be taken of drawing a loop through the mesentery, for the purpose of keeping the returned intestine in the neighbourhood of the abdominal ring, and to afford a more free escape to the stool, if a part of the returned intestine be destroyed by gangrene.

[It not unfrequently happens, that though an intestine be a dark-chocolate colour when the sac is first opened, yet immediately after the division of the stricture, the colour, which has depended only on venous congestion, begins to alter, and the gut becomes florid. This is always a very encouraging sign.—J. F. S.]

1180. If the gangrene be more severe, which is characterized by loss of gloss, by an ashy-gray colour, by a softened condition, by the easy peeling off of the outer membrane of the intestine, if the gangrenous portion be but small, it must be opened with a lancet, and the gangrenous part fastened in a corresponding position to the abdominal ring. If a loop of intestine be attacked with gangrene, and the continuity of the intestinal canal destroyed, the gangrenous part must simply be cut off with scissors, as by the previous inflammation, adhesion of the rest of the intestine with the hernial sac has been effected, which prevents all effusion of stool into the belly. If the excrement will not escape of itself, an elastic sound must be introduced. The enlargement of the mouth of the sac with the knife is dangerous, as the division easily overshoots the boundary of the adhesion and may cause effusion into the belly.

Stitching up the intestine after cutting off the gangrenous part, as proposed and performed in various ways, is objectionable, as the stitch not holding the inflamed intestinal membranes, produces extension of the inflammation and gangrene.

1181. If in the protruded bowel any wounding substance be found, it must be removed by the wound; if the intestine be so narrowed and degenerated that it can no longer allow the passage of the stools, that part must be cut off, the wound brought together, by means of LEMBERT'S stitch; or the intestine must be fixed in the abdominal ring, by a twist

of the mesentery. In very small wounds only of the intestines, may the little opening be tied up with a silk thread (A. Cooper).

1182. If in an old and bulky rupture, it be certain that it is not possible to return the contained parts, on account of the great adhesion and degeneration, the hernial sac must merely be laid bare at the abdominal ring, the strangulation relieved, and the rupture left where it was (1 .

That mode of operating in which the hernial sac is not to be at all opened, but only the abdominal ring dilated so as to return the hernial sac together with the intestine, is, in general, to be rejected, and the not opening of the sac to be most especially confined to those cases in which it is certain that in a recently produced or extraordinary large rupture, or in a rupture entirely adhering to the neck of the sac, the strangulation is seated in the abdominal ring. In most cases the connexion between the aponeurotic opening and the hernial sac is so firm that the blunt end of a knife cannot be inserted between them, especially if a truss have been already worn (2).

Although Franco and Paré had cut into the abdominal ring and did not open the hernial sac, except when reduction could not be effected, yet the practice was first generally recommended by Petit, in large and adherent ruptures; after him, by Garengeot and Monro, in recent and small ruptures, and more recently by A. Cooper; but especially by Key (*a*) and Preiss (*b*) has it been laid down, to a certain extent, as the proper practice (2). The advantages resulting therefrom, are diminution of the danger, as the hernial sac is not injured; as well as that by keeping the air from the cavity of the belly inflammation, in any injury of an artery effusion of blood into the belly, and also injuring and tearing the intestine in incipient gangrene, are prevented; and when it seems necessary, the opening of the hernial sac can always be made. These benefits are, however, sufficiently outweighed by the disadvantages, that without opening the sac no insight can be obtained of the state and condition of the parts, the tightness at the neck of the sac may be caused by the entanglement of the intestine and by the peculiar position of the *omentum*, and the operation, especially in stout persons, is very difficult, and therefore only to be confined to the above-mentioned cases. With this mode of treatment must be placed Guérin's (*c*) subcutaneous incision of the abdominal ring, which he would employ in all ruptures with recent strangulation from the ring, where, however, no sloughy destruction of the loop of intestine is to be feared. In strangulation by the hernial sac it is not applicable.

[(1) When a *rupture is large and old*, surgeons generally follow Astley Cooper's recommendation, of dividing the stricture without opening the sac and leaving the protruded gut in the sac or not, as may be. For this he assigns the following reasons:—"*first*, in very large old *herniæ*, the cavity of the *abdomen* is so much diminished by the habitual loss of the protruded intestine and *omentum*, that it becomes scarcely able to receive them again; and if a reduction is attempted, the force necessary to effect it endangers the bursting of the intestine; *second*, a large surface of intestine is exposed and handled for so long a time, as to produce, even if it does not give way, the risk of an inflammation which will probably be attended with fatal consequences; *third*, if by great pains the intestine be returned, it is scarcely possible to keep it in the now over distended *abdomen*, so that the slightest cough, or effort of any kind, is sufficient to bring it again down into the sac, and thus induce a high and dangerous inflammation; *lastly*, when great adhesion occurs, so much time is necessarily required in performing the operation, to separate the united surfaces, that fears may be justly entertained of the patient not surviving the operation. * * * Hence, in these cases, I would advise only the division of the abdominal ring; or

(*a*) Memoir on the advantages and practicability of dividing the stricture in Strangulated Hernia on the outside of the sac. London, 1833.

(*b*) Würdigung des Bruchschnittes ohne Eröffnung des Bruchsackes. Wein, 1837.

(*c*) Gazette Médicale de Paris, 1841. No. 33.

if the stricture is higher up, of the lower edge of the *transversalis* muscle; but the hernial sac should not be opened, unless the stricture is situated in the sac itself." His mode of performing the operation he thus describes:—"I made an incision three inches in length, immediately over the abdominal ring, exposing it with the knife, as well as the *fascia*, which it sends off. I then made a hole in the *fascia* large enough to introduce a director, which I thrust up behind the abdominal ring, between it and the hernial sac; and passing a curved probe-pointed bistoury upon it I divided the ring. I then introduced my finger, and feeling some resistance from the *transversalis*, I carried the bistoury upon the director up to it, and divided this also." (p. 63). It is rather odd, in referring to Cooper's first reason for following this practice, that the case on which the operation just described was performed, "had existed from the patient's (aged fifty-four) earliest years," and that it "was of enormous size, reaching half-way to the knees," yet after the division of the stricture, "it went up with a gurgling noise, as soon as his hand was laid upon the tumour." And as regards the danger of exposing and handling for a long time a large surface of intestine, as laid down in his second reason for not opening the sac, the only case he refers to is Carpenter's, who says:—"It was the largest *hernia* I ever remember to have seen;" and, having opened the sac "a large quantity of intestine, with a small piece of *omentum* protruded;" but after dividing the stricture, the adhesions were so great, that he "judged it advisable not to attempt their separation. And from the size of the *hernia*, it was quite impossible to bring the integuments over the intestine, which was therefore left exposed to the air;" yet nothing untoward ensued; "the intestine soon began to granulate, and gradually shrunk within the wound," and the patient recovered. (p. 64).

This is the operation on which Astley Cooper lays so great stress, observing:—"I feel convinced that this operation will be gradually introduced into general practice when it has been fairly tried, and found, if performed early, to be free from danger, and attended with no unusual difficulty." (p. 64).

"If we cannot accomplish our object in this manner," says Lawrence, "a small aperture may be made in the sac, near the ring, which will enable the surgeon to introduce a curved director under the stricture; the knife carried along the groove, divides the tendon with ease. When the parts are thus set free, they should be returned into the belly by pressure on the swelling, if adhesions do not prevent this; at all events, they generally admit of being replaced in part." (p. 285.)

(2) I do not think it can be fairly stated from Astley Cooper's published statements, that he is in the generality of cases favourable to, or that he recommends the practice of dividing the stricture, in strangulated rupture external to the sac, but only lays it down as the *general rule* in large ruptures. It is quite true that in his great work on Hernia, in the first part of the first edition, when treating of the operation for inguinal rupture, he says:—"An advantage is derived from dilating the stricture without cutting the sac itself, for there is no danger of injuring the intestine, &c." (p. 30); and in the second edition he speaks more at length on the subject thus:—"I have occasionally practised, and for some time recommended in my lectures the following mode of dividing the stricture without including the sac. The tendon of the external oblique having been divided a little above the external ring, the sac is gently drawn down, while the muscles are drawn up by an assistant. In this way the stricture is brought into view, and can be divided without risk, and without including the *peritoneum*," (p. 39); and he then enumerates the advantages from this practice, that there is no danger of wounding the intestine, and that if the epigastric artery is cut, as the *peritoneum* is undivided, the flow of blood would be immediately perceived, and then the vessel might be secured. But in neither edition of his Surgical Lectures, neither that in the Lancet of 1823–24, nor that edited by Tyrrell in 1827, does he allude to the division of the stricture without opening the sac, except in large ruptures. In both these editions of his Lectures he also expressly directs opening the sac and says in the one (*a*), after "feeling for the stricture, * * * you introduce the probe-pointed bistoury on the director or finger, and divide the stricture without cutting too much;" (p. 478.) and in the other (*b*), "having thus exposed the contents of the hernial sac, as far as the seat of stricture, the operator should insinuate the point of his finger or a director under the stricture, between the sac and its contents, at the upper part, carefully keeping the latter from turning

(*a*) Lancet, 1823, 24. (*b*) Tyrrell's Edition of Lectures, vol. iii.

over the finger or director. He should then pass the knife for dividing the stricture upon the finger or director, under the stricture, and by a gentle motion divide this stricture, &c." (pp. 44, 5.) I may also add that I have no remembrance of having seen him operate without opening the sac, in the many operations for strangulated rupture which I saw him perform in the Hospital during the first fourteen years of my professional life.

To Key, however, must be justly ascribed the revival of Petit's operation, and of its more extensive application (*a*). His views with regard to its employment will be seen in the following observations upon fifteen fatal cases. "The majority of the cases," he says, "appeared to have died from peritoneal inflammation consequent upon the exposure of an inflamed or strangulated portion of bowel. I say exposure of the bowel; for it is, probably, not so much the wound in the peritoneal sac that disposes to inflammation, as placing the bowel under circumstances to which it has hitherto been unaccustomed. The sudden change of temperature to which it is submitted, the exposure to light, and to a current of air, cannot but have some influence upon the delicate circulation of the part, and be productive of some impression on the nerves of so susceptible a surface as that of a strangulated intestine. And if to these influences be added the handling which the gut usually experiences, the reaction that follows these agents, we must regard as a natural consequence and likely (as experience proves) to amount to excessive inflammation. In tracing the inflammation consequent upon an operation for *hernia*, it is found to spread from that portion of the bowel that has been strangulated over the peritoneal surface of the intestines, and not to have its origin from the incision in the sac, although two wounds are usually inflicted upon it, one for the purpose of exposing its contents, and another, higher up, to divide the stricture. The *peritoneum* about the seat of stricture exhibits fewer signs of acute inflammation than the investment of the bowels." (pp. 11, 12.) After giving an "outline of these cases," Key observes, "it is obvious that the attempt to relieve the stricture without exposing the contents of the sac, could not have been attended with any untoward consequences in any of the cases, with the exception of the two cases of gangrene, Nos. II. and XII.; and in these the symptoms denoting the approach or existence of *sphacelus*, were sufficiently marked to point out to the operator the necessary mode of proceeding. Some of the other cases, in all probability, would have been benefited had the sac been left entire." (p. 26.)

Lawrence does not agree with Key in "ascribing the unfavourable state of bowel which was found in so large a proportion of his thirteen cases, (the other two not having been operated on,) and which, I believe, will be met with in the majority of those who die after the operation, to the operation itself and its attendant circumstances, namely, exposure to air and light, change of temperature and handling. I think it rather owing to the pressure of the stricture, which affects the parts, not like the slight violence of the operation, for a few minutes only, but uninterruptedly for hours, and sometimes days, disturbing the circulation, making an impression on the intestine as if it had been tied with a string, and sometimes causing ulceration either of the internal tunics or of the bowel in its whole thickness. That inflammation excited by this kind of injury may cause death is clearly proved by Mr. Key's cases. * * * When we find the intestines at the time of the operation mortified, as in cases II. and XII., distended and discoloured, so that it could not be replaced, and required to be opened, as in case V., so altered that the operator would not venture to return it, as in cases III. and VII., the mischief is obviously independent of the operation, and its source is rendered unequivocal when we see the tube marked by the stricture, and mortified at the part thus impressed, as in case IX." (pp. 279, 80.)

From a very careful consideration of the circumstances attended on strangulated rupture, and from observation of the appearance which the bowel too frequently exhibits, and the results which follow, I cannot but agree with Lawrence that the mischief is rather owing to the "pressure of the stricture," than with Key, that it is "consequent upon the exposure of an inflamed or strangulated portion of bowel." But I think it is impossible to doubt that an additional cause is to be found in the unwarrantably violent and repeated squeezing which the rupture suffers during the use of the *taxis;* so that one is only astonished that the gut is so rarely burst, and the patient destroyed in a few hours. And then, as Key has well expressed it, "an

(*a*) Memoir, above cited.

operation is often regarded as a forlorn hope, resorted to in the extremity of danger, when the injurious effects of delay and violence combine to preclude a chance of success. The effect of exposing a contused part is seen in a common bruise; if the soft parts are severely contused, the skin remaining entire, the inflammation that follows subsides without injuring the texture of the part. But if a small wound accompanies the injury, the inflammation proves destructive in its effects: sloughing of the cellular membrane, with copious suppuration ensues, and the process of healing is tedious. Between a common contusion and an intestine, or *omentum* bruised by the *taxis*, there is a close analogy: a breach of texture, in the one case, leads to the same effects as exposure in the other. Inflammation is in both the result: and the vitality of the parts being impaired, disorganization in both cases follows as the consequence of inflammatory action. If the contusion be not accompanied by a breach of the surface, no harm is anticipated: and just so if the bruised contents of a *hernia* are returned without a wound of the peritoneal sac, and consequent exposure, inflammation, if it does come on, seldom proves severe, and still more rarely fatal." (pp. 58, 9.)

Admitting that "the condition of the bowel, that above all others renders it an imperative duty to open the sac, is that of gangrene," and stating that "it is a remark made by some surgeons of experience that the intestine is occasionally found to be in a state of gangrene when no symptoms had existed before the operation to raise a suspicion of mortification having taken place," Key observes, "it does not, however, appear, that any pains have been hitherto taken to form a correct *diagnosis* of the circumstances under which gangrene has actually taken place; nor am I prepared to say, that, in all cases, such a certainty of *diagnosis* is attainable; I think, however, that if the attention of the profession were more closely directed to the consideration of the condition preceding gangrene, a near approach might be made, sufficiently accurate to direct the surgeon's practice in all cases." (pp. 103, 104). I cannot agree with Key that "the ordinary characters of a completely sphacelated portion of bowel are distinct enough," for I am quite sure that I have seen them all existing more than once or twice without any gangrene, but simply depending on the unwarrantable violence used in attempting to return the rupture. But I do agree with him, that "it sometimes happens that no such change takes place in the swelling, and then the evidence of gangrene is much more equivocal." It is by no means infrequent to find an intestine mortified, although the time it has been strangulated is short, and not the slightest external sign leads to the presumption of its condition: as, on the contrary, it now and then happens that the exterior of the swelling is tender, inflamed, doughy, and crackling, from the causes I have just mentioned, and yet the intestine within be healthy, and the patient recover the operation. As regards the loss of elasticity in the swelling, I believe it a very uncertain sign; the intestine may be gangrenous, but the sac full of fluid, as is commonly the case under such circumstances, and then the elasticity remains. The only sign which I think can be relied on, though even that is doubtful, is when the gangrenous intestine has burst: then, indeed, although the redness, doughiness, and crackling still remain, the rounding of the swelling subsides, and when a little pressure is made on it a central hollow is produced, and a sense of yielding beneath, very different from the pitting caused by pressure on œdematous cellular tissue.

Key mentions a case which occurred to him, in which "a fetid smell, similar to that described by Sir A. Cooper, was perceptible in the progress of the operation, before the sac was opened." The patient had a femoral rupture, and "a fetid smell arose from the swelling as soon as *the fascia propria* was opened: it was a smell arising from a decomposed portion of bowel, and the transudation of its fæcal contents. The intestine proved to be quite gangrenous, being black, devoid of lustre, and lacerable. Such a *fetor* might, I apprehend, be discovered in most cases of *sphacelus* before the sac is opened; its absence should be ascertained in every case in which the contents of a *hernia* are to be returned without opening the sac. Before disorganization of the coats of the intestine takes place, transudation of fluid or of fetid air is probably prevented. In incipient gangrene, therefore, it is not to be expected." (p. 109).

One instance of fetid smell before opening the sac occurred to me in the case of strangulated umbilical rupture, (No. X, in my Table,) which had been so for thirty hours; but on exposing the gut at the operation, part of it was quite natural, and part dark chocolate-coloured, but shiny, and did not seem to be mortified; after death,

at forty-eight hours from the operation, it had a dirty clay-coloured appearance, very different from that when first exposed.

Admitting that the presence of the fetid smell is always indicative of gangrene, though it has been rarely observed, yet its absence is no certain sign of the healthy state of the intestine; and, therefore, some still more definite symptoms of this dangerous condition of the gut are requisite before it can be decided with certainty previous to opening the sac.

Lawrence adheres to the old practice of opening the sac and dividing the stricture from within; he says:—"The mode of proceeding thus recommended by Sir Astley Cooper, and executed by him with perfect facility," which is also fully confirmed by Key's practice and experience, "would be found difficult to those less intimately conversant with the anatomy of ruptures, and in some cases, probably impracticable. It is therefore fortunate that we cannot regard it as a matter of much consequence. When the hernial sac has been freely laid open, we cannot suppose that the additional division of its neck will much increase the chance of *peritonitis*. If the stricture be divided in a proper direction, the epigastric artery is not endangered. Nor can the intestine be wounded if due care is taken to protect it, by using a deeply-grooved director, or by carrying the curved knife along the finger. It may also be carefully held out of the way when the stricture is divided, either by the operator or assistant; or it may be covered at that time by the handle of a scalpel. Let me observe further, that the method of dividing the stricture on the outside of the sac does not necessarily secure the protruded parts from injury. In an attempt of this kind recorded by Pelletan (*a*), the intestine was wounded. The question of eligibility between the ordinary course of proceeding, and this modification must be determined, like all other practical matters, by experience. Unless unequivocal advantage should be found in the latter, I should not recommend its adoption, being unwilling to introduce without absolute necessity, a new difficulty into an operation, always requiring consideration and caution, and frequently attended with embarrassing circumstances." (p. 290).

From my own personal experience of the division of the stricture external to the sac, I can say nothing, never having performed it. But I do not think so great advantage is gained by not opening the sac, as is stated. From all the cases I have observed, either in the practice of others or in my own, I do not think cutting through the hernial sac, and consequently opening the peritoneal cavity, so serious as generally considered. If inflammation of the *peritoneum* have not been previously set up, either by the rough usage of the rupture, or by the irritation which a long strangulated or gangrenous gut produces, I cannot understand why making a small opening into the peritoneal cavity should be more dreaded than the long slits, which are now made without compunction, for the removal of diseased ovaries, and so forth. There are, however, some conditions which even those who advise leaving the sac untouched, admit, require that it should be opened, namely, confinement of the protruded parts by entangling bands, or by adhesion to the sac itself, and a gangrenous condition of the bowel. Under all circumstances, therefore I am still disposed to continue the practice of opening the sac, as I have hitherto done believing it to be the most safe. I cannot conclude these observations without stating that I believe much of the fatality attendant on operations for strangulated ruptures, depends on the improper after-treatment. I well recollect the time when, as soon as the patient was put to bed, he was dosed with senna and salts, with a view of speedily procuring stools, and his already irritable bowels being thereby rendered still more irritable, he speedily sunk. Although this practice is probably less followed now than formerly, yet I am afraid there is still too great inclination to employ purgatives too early. For a few hours nothing more than a clyster should be given, and not even that, unless the patient be very uneasy in his bowels, and puffed up with wind. Not unfrequently they relieve themselves, and only after twelve or eighteen hours is it advisable to give medicine by the mouth, for the purpose of completely clearing the whole intestinal canal. And unless there be any special indication for calomel, I believe that castor oil is the best remedy of all.

Luke, who is a great advocate for Petit's operations, observes (*b*) that "the operation itself admits of a very brief general description. It consists of an incision of

(*a*) Clinique Chirurgicale, vol. iii. p. 102.
(*b*) Operation for Strangulated Hernia; in Med. Gazette, vol. i. 1839–40.

the integuments over the seat of the stricture, followed by a division of the subjacent cellular texture and *fascia*, to which succeeds the cautious division of the stricture itself; and afterwards the hernial contents are returned into the *abdomen*, as by the *taxis*, without exposure. In femoral and in umbilical *hernia*, for all practical purposes of the operation, the seat of stricture may be assumed to be at the respective abdominal apertures, although in the former *hernia* there is occasionally some light variation upon that point. * * * In inguinal *hernia* the seat of stricture is far more variable, and the range of its variation extends from the internal abdominal ring to the *scrotum* in the male; consequently, without some previous indication to guide the operator, the external incision may be made over one extremity of the range, when the stricture is far away at the other, and a fruitless search may be the probable result. * * * There are several ways of conducting the necessary examination to obtain the desired *diagnosis*, all of which depend for their success upon the stoppage of the communication of impulse from one part to another by the stricture. Thus, if the body of a hernial tumour be compressed by the hand, an impulse is communicated to all its parts below the seat of stricture; but if the neck of the *hernia* be grasped between the finger and thumb of the other hand, above the stricture, while such compression is made there will not be any impulse felt. When, in the commencement of the examination the neck of the tumour is first grasped, we may be always assured, that if an impulse is felt on compression of the tumour itself, the seat of stricture is nearer to the *abdomen;* and by gradually withdrawing the finger and thumb in that direction, while renewed compression of the tumour is made, a point will be soon reached at which impulse ceases to be felt. The point at which impulse first ceases to be felt, is the seat of stricture. In like manner, if an impulse is not felt when the neck of the tumour is first grasped, we may be equally assured that the stricture is situated nearer to the body of the *hernia;* and, by a like gradual approximation to it with the finger and thumb, an impulse shortly commences to be felt. That point is the uppermost part of the strangulated contents, which implies that the stricture is immediately above it; and, on inquiry, it will be found to correspond with the indications of an examination commenced from below, as just mentioned; and thus the two modes of examination will tend to the correction of errors, to which each separately is liable. The same information may be obtained by attending to the point of cessation of impulse when the patient coughs; but this method is irksome and painful under circumstances of acute peritoneal inflammation, and on that account is not so generally desirable as that detailed. Yet much valuable information not otherwise attainable may be afforded by using this method in conjunction with that furnished by compression of the tumour. In some cases the stricture occupies a considerable portion of the neck of the *hernia*, but in most it is confined to a limited space. In the former case, before performing PETIT'S operation, it is desirable to be acquainted with those limits, in order that, when extensive, suitable provision may be made for its complete division. The combination of the two examinations has this knowledge for its object, which is easily attained by attending to the points of cessation of impulse. The point of cessation of impulse on coughing indicates the upper boundary of the stricture, and the point of cessation of impulse on compression of the *hernia*, indicates its lower boundary of the stricture: and, consequently, the boundaries are the limits of its extent." (pp. 865, 66.)

He further observes:—"The probability of the necessity to open the sac to effect a return, is much increased when the stricture is caused by its thick and indurated neck. * * * When the stricture is situated exteriorly to the sac, a director may generally be easily introduced under it, and it may be as easily divided with a bistoury; but when the neck of the sac itself forms the stricture, no such measure can be adopted. In such cases its division should be accomplished by cutting the indurated and thick substance on its exterior surface only, taking the greatest care that the knife does not penetrate to the interior of the sac. If this step has been properly performed, the division is only partial, and little amount of relief will ensue. To render the relief effective, the partial division of the indurated neck should be repeated in one or two other situations on the circumference of the stricture, by which, at length, the stricturing substance is so far weakened in its power of resistance, especially when unsupported by surrounding structures, that it becomes susceptible of dilatation by the very moderate interior pressure of the hernial contents during the efforts of the *taxis*. Success does not frequently attend the first efforts, so that re-

newed partial divisions, and renewed efforts are mostly required; and, however unpromising such cases may be, experience enables me to state that in this way they often admit of relief without the necessity of opening the sac. The proportion of failures in the attempt is, from its nature, greater than that which is experienced in *herniæ*, strictured by the margins of the abdominal apertures; yet inclusive of these failures, I have not any reason to consider their general amount large, having sustained only five failures out of thirty-two cases, on which I have attempted to leave the sac unopened." (p. 866.)

There is much good in the preceding observations, on which account I have so largely quoted them; but the success resulting from this practice, so very far beyond what usually happens in cases of strangulated rupture, leads to the suspicion that some of the number mentioned, might, perhaps, have been relieved without other operation than the *taxis*.—J. F. S.]

1183. When the intestine has been properly returned into the belly, and the wound and surrounding parts cleaned, the edges of the wound must be brought together either with sticking plaster or with a stitch, covered with wadding and a compress, and this dressing bound on with a suitable bandage. The patient should be put in such position that the belly shall be relaxed, with his chest raised, and his thighs drawn up; he must observe the strictest quiet, and take only mild mucilaginous drinks. In general some hours after the operation the bowels are relieved of themselves; but if this do not happen, an oily mixture may be given, castor oil, clysters, calomel, and if no inflammatory symptoms exist, an oily mixture, with common salt. The dressing must be replaced as often as necessary, and a slight compression made opposite the abdominal ring. When the wound has scarred, a proper truss is to be applied. If inflammatory symptoms occur, they must be treated antiphlogistically. If there be inflammation, consequent on still existing strangulation, or if protrusion of the intestine again happen, and it be painful to the touch, the part must be returned into the belly by introducing the finger. If symptoms of strangulation still continue, on account of entanglement of the intestine within the belly, its adhesion or narrowing, the intestine must be protruded by coughing, or by introducing the finger. If the strangulation still continue several days after the operation, and the intestines be still protruded on account of adhesion, it may then be advisable, in complete obstruction of the intestine, to open it with a lancet.

Key (*a*) notices one circumstance in the after-treatment, (especially in inguinal ruptures,) in which symptoms resembling those from strangulation occurred, viz., the transition of inflammation of the sac into suppuration. The *scrotum* swells up a day or two after the operation, becomes painful, hiccough and vomiting recur, the relief of the bowels is diminished or suppressed, and, from the fulness of the hernial sac, the patient has the sensation as if the rupture were again protruded. Distinct fluctuation is ordinarily not to be felt, on account of the thickening of the membranes. At first leeches and evaporating washes are to be applied, subsequently poultices, the closed wound is to be punctured with the lancet, and an escape made for the pus, *whereupon* the symptoms soon subside.

[I have had one case of suppuration of the sac of an inguinal rupture, but it did not cause any peculiar or dangerous symptoms, and after a few days emptied itself, and gave no further inconvenience.

I have once seen in a young man, operated on for scrotal rupture, and who was purged violently for some days, after taking five doses of two grains of calomel, with half a grain of opium every six hours, for *peritonitis*, inflammation extend from

(*a*) A. Cooper's Hernia, p. 58, *note*.

the sac up to the navel, and round into the loin, which terminated in large sloughing of the cellular tissue; but he ultimately recovered.—J. F. S.]

1184. If the intestine be sloughy, it must be merely covered with a light compress dipped in a mucilaginous fluid. When all the slough is thrown off, and the artificial *anus* or fæcal fistula is formed by the union of the destroyed intestine with the neighbouring *peritoneum*, care is merely requisite for the due escape of the stools, the aperture is to be covered with wadding, and all pressure removed; the patient should take nourishing and easy digestible food; clysters and gentle purges should be often given.

[In general during the course of strangulation, the gut becomes so adherent to the mouth of the sac, that if it should mortify and burst, or if it be purposely opened by the surgeon during the operation, it rarely recedes, and the stools, passing by the wound form an artificial *anus*.

On the other hand an intestine may be returned into the belly, and slough afterwards. Key mentions a case (*a*) under Astley Cooper, in which strangulated inguinal rupture was operated on, "and the intestine, though dark-coloured, appearing to be merely congested, was returned into the *abdomen*. In the evening of the same day he passed stools *per anum*, and appeared relieved. On the third day, as soon as the poultice was removed, a quantity of fæculent matter was seen issuing from the opening; the discharge of *fæces* continued for five days, at the end of which time it altogether healed, and the wound speedily cicatrized." In another case, a strangulated congenital rupture, which occurred to Key himself; on the fourth day after the operation "a copious discharge of *fæces* had taken place at the wound. The *abdomen* had remained tender since the operation, but he had discharged *fæces per anum*. The discharge did not cease for several days, and delayed the healing of the wound. But at the end of about sixteen days, he became convalescent, and the wound entirely closed." (pp. 111, 13.) Lawrence mentions a remarkable case of bubonocele, which was operated on by Ramsden:—"The gut, which was much discoloured, was returned without difficulty, but seems not to have completely re-entered the abdominal cavity. On passing the finger as high as the incision would admit, if it did not fairly reach the *abdomen*, it seems as if the intestine, although free from stricture, were contained in a peculiar membranous bag." Clysters, which were ordered, could not be forced up, which led to examination of the *rectum*, and thence some hardened *fæces* were removed. She was much exhausted, but, by care, had considerably recovered next morning, and the bowels not having been moved, calomel and colocynth extract were given every two hours, which, in the evening, began to operate, and before morning she had eight or ten stools. She continued for a time in a very fluctuating state, but well-grounded hopes of her recovery were entertained till "she was seized, in about six weeks after the operation, with violent pain in the lower part of the *abdomen*, which terminated in two days in a discharge of *fæces* from the wound, and perfect ease. The appetite now failed, the strength decreased, and death took place on the tenth day from the appearance of *fæces* in the wound. On *examining* the body, the whole of the intestines were found so strongly adherent to each other, that they could not be separated without laceration. A portion of the *ilium*, the same, probably, which had been protruded, adhered to the abdominal ring. Its coats were greatly stretched, and its canal was much contracted. A small ulcerated aperture was discovered in this part; and led, in a fistulous form, through a substance nearly equal in size to the little finger, to the external wound." (p. 328.)

It has been well observed by Key, that, "cases are sometimes met with in which the patient appears to be doing well after the operation, the evacuations being free and natural, and the sickness and pain subsiding; but after the lapse of two or three days the powers begin to sink, the *abdomen*, though not very tense, is uneasy under pressure; the pulse small and quick, and the tongue becomes dry and coated. This condition is, perhaps, protracted for several days, and the patient at length dies. A *post mortem* inspection discovers the cause of death in the dark colour and lacerable condition of the strangulated portion of the bowel and the vascular state of the surrounding parts. This unexpected termination of a case when it does occur, usually

(*a*) Memoir.

takes place in patients of enfeebled constitution, whose powers are unequal to the restoration of the healthy circulation in the strangulated bowel after its release from the stricture; and in whom, therefore, a slight degree of inflammation gradually ends in the extinction of its vitality. At the period of the operation the intestine, when exposed, presents none of the usual indications of present or approaching gangrene; no infiltration of its tissues, no discoloration beyond that which retarded circulation in a healthy bowel produces, no lack of peritoneal lustre, and no lacerability of texture; it in no point appears to differ from those cases of strangulation, in which an early operation is had recourse to before severe symptoms come on, and in which a favourable *prognosis* is verified by a rapid convalescence. Exposure of a portion of bowel possessing such feeble powers of resistance to morbid influence cannot but tend to increase, probably to excite, a disposition to inflammation; which though low in degree, is sufficient to destroy its vitality: and it may therefore be fairly regarded as the main agent in the production of gangrene." With this explanation I cannot agree; the mischief has been done to the bowel, or at least its foundation is laid, I believe, before the sac is opened, by the disturbance of the circulation during the strangulation, from which the bowel has not power to recover itself; and according as the stagnation of the blood has existed for a shorter or longer time, and to a less or greater extent, so does the mischief run on subsequently to inflammation and gangrene.—J. F. S.

"In cases in which great depression of the powers is observed to precede the operation," continues KEY, "death sometimes rapidly takes place without any other obvious cause than the exposure of the bowel. The condition of the patient is often found to be manifestly worse after the operation, and stimulants are obliged to be plentifully administered, in order to sustain the sinking powers of life. This may happen without inflammation of the abdominal cavity, or gangrene of the bowel; and is attributable solely to the depressing effect of the operation. The pulse, which before the operation was feeble, becomes fluttering, and scarcely perceptible; the countenance which was anxious, now bespeaks the approach of death; the skin is covered with a clammy moisture, and the whole frame is siezed with a restlessness that gradually ends in the calmness of dissolution." (pp. 51–4.)

ASTLEY COOPER mentions the very remarkable circumstance of *tetanus* following the operation for rupture, on the eighth day, by which the patient was speedily destroyed (*a*.)]

(*a*) Above cited, p. 58.

Tabular View of Operations

	Kind.	Sex.	Age.	Duration.	Truss.	Strangulation.	Vomiting.	Constipation.
1835. I. Aug. 17	Right scrotal, not small.	Male ...	43	From childhood, but not congenital.	Worn for last seven years	11½ hours.	Seven hours, little.	Not mentioned how long.
1836. II. May 10	Left direct scrotal, (also on other side,) size of pigeon's egg.	Male ...	73	15 years.....	.....	3 days...	Constant. ..	3 days...
III. Oct. 29	Scrotal, large as child's head of two years.	Male ...	45	19 years.....	.....	12 hours..	Symptoms not urgent.	
1837. IV. Jan. 24	Scrotal, left, (also on other side,) size of an orange.	Male ...	82	40 years. (incarcerated.)	.....	4 days...	None	4 days...
V. Sept. 24	Femoral, right double sac.	Female.	56	9 years.....	Four years cup truss.	3 days...	Much	3 days...
1838. VI. Sept. 27	Scrotal, right, as large as a pear.	Male ...	46	2 years.....	For some time (Symptoms of strangulation so that I did not operate for 24 hours.)	36 hours..	Slight ..... scarce,	24 hours naturally but since by clyster
VII. Nov. 4	Femoral, right, of large size and oblong form on POUPART'S ligament, then bending down and extending into *labium*.	Female.	55	10 years.....	Truss not fitting.	10 hours..	Much throwing up of wind, but no vomiting.	36 hours..
VIII. Nov. 28	Right scrotal, congenital; three fingers thick, one long.	Male...	22	Says he has only noticed the swelling 12 months.	Suspensory...	12 hours..	Much	24 hours..
IX. Nov. 29	Femoral, (right,) not large, but flaccid.	Female.	43	12 years.....	Six weeks	47 hours..	Much	47 hours..

* Upon these cases I operated in St. Thomas's Hospital during the first four and a half years of Subsequent severe illness has twice broken in on me, and prevented me keeping so regular an advantage which accrues from such tables.—J. F. S.

*for Strangulated Rupture.**

Tenderness.	Contents.	Bowels moved.	Result.	Additional Remarks.
Of belly little, of rupture ditto.	Eight inches gut only, bright and turgid, thickened.	Freely within an hour.	Cured.	
Of belly much, with præcordial pain and hiccough from first day, which continued till third day after operation, and pain in belly ceas'd.	Sac divided by vertical *septum*, *omentum* before, gut behind; two inches gut, bright chocolate-coloured.	After 24 hours free motion from repeated clysters; the bowels continued to be moved, but though assisted with stimulants and nourishment, he gradually sunk.	Died on ninth day; intestine at mouth of sac still dark coloured, little inflammation.	Large quantity of fat between cremaster and sac. I wounded intestine in opening sac with knife.
Of rupture, probably from attempts at reduction.	Half yard of intestine, front half of which chocolate & thickened, other unaltered; also large mass of *omentum*.	A slight motion from clysters after 24 hours; after same interval, and castor oil and clyster, bowels moved freely.	Cured (stricture not tight.)	Attempts were made to diminish size of rupture by application of ice, but without avail. The dresser had also given tartar emetic. The *omentum* was left. The gut came down again on ninth day, in getting out of bed, but slowly returned.
Of the rupture a little.	Much adhering *omentum*, almost schirrous; a small portion of *colon* healthy.	In eight hours after two clysters some *scybola* came away. Next morning he had calomel and castor oil, and the bowels were freely moved.	Cured (stricture none but without dilating.)	Ice was applied for three hours before operation without benefit. Dilated the stricture and left the gut, but tore and cut off *omentum*. Probably in this case the *colon*, together with its peritoneal connexion to the iliac pit, descended, but I did not notice this at the operation.
Of the belly; has had hiccough throughout whole day; tenderness ceased on second day.	Bit of *omentum*, size of a walnut, in little sac; four inches choc. intest., shining, but slightly adherent, and much matted *omentum* in large sac.	An hour after, the bowels very freely opened, and again three hours after.	Cured (stricture not very tight.)	The larger piece of *omentum* was cut off.
None in belly nor in rupture.	Three inches chocolate, with a little patch of adhesive; no *omentum*.	Within eight hours after twice castor oil, very copious motions.	Cured (stricture very tight.)	Cremaster enormously thickened.
At lower part of belly, near the swelling.	*Omentum* in *labium* soft, but in true sac firm and matted; in true sac knuckle of bright gut.	Within first nine hours the bowels thrice sparingly relieved by clyster. She went on very well, but the bowels were not satisfactorily moved till four days after the operation, although she had calomel and opium twice a day, with occasional castor oil and senna and salts.	Cured, (stricture very tight.)	The inside of the sac had probably burst, and allowed the gut to escape into the *labium*.
Pain in belly, tenderness of rupture.	Two inches gut dark-coloured, bright.	Bowels moved by clyster and castor oil freely between 12 and 16 hours after operation.	Cured, (stricture at internal ring very tight, and like movable membranous ring.	
A little pain in belly when pressed.	Healthy, bright, and dark-coloured gut.	Nine hours after operation bowels freely moved by clyster.	Cured, (stricture tight.)	

my Assistant Surgeonship; and it will be observed that for one whole year I had not a single case. account since; but I hope yet to resume and continue a similar one, as I am convinced of the

	Kind.	Sex.	Age.	Duration.	Truss.	Strangulation.	Vomiting.	Constipation.
1840. X. April 18	Femoral, (right,) swelling large.	Female.	62	24 years.....	Partially irreduc.	23 hours..	Much	36 hours..
XI. June 15	Umbilical,(as large as a half-quartern loaf,) with cleft, so as to have hour-glass form.	Female.	60	12 years.....	Partially irreduc., no truss.	30 hours..	Much, 12 hours.	36 hours..
XII. July 4	Femoral, (right,) always small.	Female.	57	20 years.....	No truss.....	3 days...	Much, three days.	5 days...
XIII. July 30	Scrotal, (left,) size of pigeon's egg.	Male...	60	14 years.....	Has worn	6 hours..	Much	.....
XIV. Aug. 16	Scrotal, (right,) also on left.	Male...	59	54 years on left 18 on right after blow.	Has worn	26 hours..	Much	36 hours..
XV. Oct. 29	Femoral, (right,) size of pigeon's egg.	Female.	45	20 years.....	Has worn till within last three years.	4 days...	36 hours, much.	4 days...

Tenderness.	Contents.	Bowels moved.	Result.	Additional Remarks.
Much pain in belly, and not relieved by the operation; no pain nor tenderness in swelling.	Much adhering *omentum*, four inches of intestine very dark, but shining.	A few *scybola* brought away by clyster 22 hours after operation, but nothing more.	Died 18 hours, (stricture very firm.)	Fetid smell on opening the sac. The adhering *omentum* was left alone. The vomiting continued after the operation almost to the last. On *examination*, the intestine gangrenous, with mark of separation; intestines slightly glued.
Swelling tender.....	Sac divided by transverse band; hard mass of *omentum*, adherent in upper portion; 8 inches of dark chocolate bright intestine.	Bowels relieved of thin motion 30 hours after operation, not without calomel and opium every two hours seven times; a single dose of calomel and clysters had previously been useless.	Died 48 hours, (stricture not tight.)	Fetid smell before opening the sac. A deep tough band of cellular tissue indented the hernial sac, which also had a corresponding deep fold. Vomiting continued till death. On examination, the intestine dirty clay-colour; no *peritonitis*.
Pain, but not tenderness, in the belly.	Very small knuckle of dark-coloured bright gut.	Three hours after operation a few small *scybola* after clyster, but after castor oil the bowels were freely moved during the day; purging came on on third day.	Died 65 hours, (stricture very tight.)	No account of examination.
Much pain in belly..	Large knuckle of dark gut, very tense, and peritoneal coat seemed cracked.	Bowels twice moved within 12 hours by castor oil.	Cured, (stricture very tight.)	
Much pain in belly; after operation complained of pain about navel, which did not subside.	Half yard of gut, not deep-coloured, but much thickened and slightly ecchymosed.	Within 24 hours his bowels freely moved by clyster; after which they continued tolerably regular. Calomel and opium were given every six hours, and when his powers began to fail, brandy and arrow-root.	Died six days after, (stricture not tight, but required division, as also a band below it.)	The *scrotum* very large, much reddened, probably from efforts and crackling. Much difficulty in returning gut on account of its thickness. In course of the second day hiccough came on, and some sickness, which subsided, but came on next day, and frequently after to the last. Nor was it checked but slightly by hydrocyanic acid. On examination, all the intestines were found glued together; strangulated gut not restored; suppuration between cremaster and sac.
Much pain in belly, with tympany.	Mass of healthy *omentum* adherent, small bit of reddened but not dark gut, size of top of thumb.	The bowels were not moved till a few hours before death.	Died 36 hours, (stricture tight.)	She was, when first seen, very much depressed, and the surface cold. Three or four ounces of straw coloured fluid escaped from the belly after reduction, immediately on the return of the gut. The *omentum* left in sac. Calomel and opium were ordered directly after the operation on account of the pain and tenderness of the belly. Egg and brandy, and other nourishment were given without avail. Slight *peritonitis*; only a portion of intestinal tube, size of sixpence, had been strangulated, and lay just above mouth of sac.

Second Chapter.—OF ABDOMINAL RUPTURES IN PARTICULAR

I.—Of Inguinal Rupture.

(*Hernia inguinalis*, Lat.; *Leistenbruch*, Germ.; *Hernie inguinale*, *Bubonocèle*, Fr.)

Camperi, P., Icones herniarum inguinalium, edit. a S. Th. Soemmerring. Francof, 1801.

Cooper, Astley, The Anatomy and Surgical Treatment of Abdominal Hernia. Part i.

Rudtorffer, F. X., Abhandlung über die einfachste und sicherste Operationsmethode eingespenter Leisten-und Schenkelbrüche; nebst einem Anhange merkwürdiger, auf den operativen Theil der Wundarzneikunst sich beziehender Beobachtungen. Wien, 1805. 8vo. 2 vols.; with eight plates.

Hesselbach, F. C., Anatomisch-chirurgische Abhandlung über den Ursprung der Leistenbrüche. Würzburg, 1806. 8vo.

————, neueste anatomisch-pathologische Untersuchung über den Ursprungund das Fortschreiten der Leisten und Schenkelbrüche. Würzburg, 1815. 4to.; with fifteen copper plates.

Wattmann, Ueber die Vorlagerungen in Leistengegend. Wein, 1815.

Langenbech, Commentarius de structura peritonæi ,testiculorum tunicis, eorumque ex abdomine in scrotum descensu; ad illustrandam herniarum indolem. Götting., 1817. fol.

————, Abhandlung von den Leisten-und Schenkelbrüchen, enthaltend die anatomische Beschreibung und Behandlung der selben. Götting., 1821; with eight copper plates.

Meckel, J. F., Tractatus de morbo hernioso congenito singulari et complicato. Berol., 1772.

Sandifort, Icones herniæ inguinalis congenitæ. L. B., 1788. 4to.

Wrisberg, Observationes anatomicæ de testiculorum ex abdomine in scrotum descensu, ad illustrandam in chirurgia de herniis congenitis utriusque sexus doctrinam; in Comment. Soc. Reg. Scient. Götting., 1778.

Sinogowitz, Anleitung zu einer zweckmässingen Manualhülfe bie eingeklemmten Leisten und Schenkelbrüchen. Danzig, 1830. 8vo.

[Darrach, W. E., The Anatomy of the Groin. Philadelphia, 1830. folio.—g. w. n.]

Zahner, Chirurgische Anatomie der Brückstellen am Unterleibe; inaug. Abhandl. Erlangen, 1833.

Hammond, William, Anatomy and Surgery of Inguinal and Femoral Hernia. London, 1834. fol.

Also the writers before mentioned.

1185. *Inguinal Rupture* passes through the *abdominal ring* (*annulus abdominalis*); it may be either *Scrotal*, (*Hernia scrotalis*, Lat.; *Hodensackbruch*, Germ.; *Oscheocele*, Fr.) when descending into the *scrotum*, or *Labial*, (*Hernia labii pudendi externi*, Lat.; *Bruch der ausserer Schaamlippe*, Germ.; *Hernie des grandes lèvres*, Fr.) when passing into the *labium*.

1186. The *front* or *outer abdominal ring* is the external opening of the *inguinal canal*, (*canalis inguinalis*), and is formed by the tendon of the external oblique muscle stretching from the upper front spine of the hip-bone to the pubic *symphysis*, (Poupart's *ligament* or the *external inguinal ligament* of Hesselbach), where the fibres separating, attach themselves by one part (the *inner pillar of the ring*) to the pubic *symphysis*,

and by the other (the *outer pillar of the ring*) to the spine of the share-bone. A triangular opening is thus formed, of which the share-bone is the base, and the point inclining upwards and outwards is the junction of the two pillars. By the splitting of the muscular fibres of the internal oblique abdominal muscle, the junction of its tendon with that of the transverse muscle, forms the other part of the inguinal canal. The internal opening of the inguinal canal (*hinder or inner abdominal ring*) is formed by an *aponeurosis*, (the *fascia transversalis* of COOPER, the *internal inguinal ligament* of HESSELBACH, *the external layer of the peritoneum* of LANGENBECK), commencing from the hinder edge of POUPART's ligament, which seems to twist itself upwards and backwards. This *aponeurosis* loses itself above in the cellular tissue which overspreads the inner surface of the transverse muscle, and is continued to the under surface of the diaphragm. Internally it arises from the outer edge of the tendon of the straight muscle, which unites with it, and therefore at this part it is strongest. Where the strong fibres of this *aponeurosis* ascend obliquely outwards over the femoral vessels, they form an oblong aperture for the passage of the spermatic cord (which, according to CLOQUET, is covered by this *aponeurosis*, to the testicle, where it is connected to the vaginal tunic) (1). The inguinal canal is directed from without and above, inwards and downwards, as it passes from the hinder or inner to the front or outer ring, and is from one inch and a quarter, to an inch and a half long. Its front wall is formed by POUPART's ligament, and a small part of the internal oblique muscle; its hind wall inwards and upwards by the delicate fleshy bundles of that muscle, and below and without, by the *fascia transversalis*. In the male the spermatic cord passes through the inguinal canal, and is surrounded besides by the process of the transverse *fascia*, by cellular tissue, and covered by the cremaster muscle, (the lengthened fibres of the internal oblique muscle), the general vaginal tunic, (*tunica vaginalis communis*, according to LANGENBECK), a process of the external layer of the *peritoneum*. The external surface of the external oblique muscle is covered with a delicate aponeurotic expansion considered to be a process of the *m. fasciæ latæ femoris*, and which spreads over the front inguinal ring and the spermatic cord (*tunica dartos*, *fascia superficialis* of COOPER) (2). The epigastric artery arises from the external iliac above POUPART's ligament, ascends between the transversal *fascia* and the outer layer of the *peritoneum*, inwards and upwards, on the inside of the hinder or inner inguinal ring, there crosses the spermatic cord, reaches the edge of the straight muscle about an inch and a half from its origin, and runs upwards on its hind surface. If the region of the groin be examined on the peritoneal side, the trace of the obliterated vaginal tunic is seen at the point which corresponds to the hinder inguinal ring, and in many cases there is a depression in the *peritoneum*, which indicates the upper part of that tunic remaining open; on the inner side of this spot lies the epigastric artery. Between this and the umbilical artery, opposite the front or outer inguinal ring, is seen a slight depression, (inguinal pit, *fovea inguinalis* of HESSELBACH,) where the *peritoneum*, towards the external ring, is covered only by the weaker parts of the transversal *fascia*, and by the delicate bundles of the internal oblique muscle.

[(1) The description of that most important part in ruptures, both inguinal and femoral, namely, the *fascia transversalis*, is not given by Chelius so clearly as might be; for it is far less difficult either to dissect or describe than commonly considered. At the onset it must be remembered that it is not a tendinous, bnt merely a cellular membranous structure, much condensed, and connecting the whole hind surface of the abdominal muscles with the front of the *peritoneum*. It is not part nor process of Poupart's ligament, but simply attached to it by one of its processes, whilst the other descends behind it, the former commonly called the iliac, and the latter the pubic portion of the *fascia transversalis*. The iliac portion commences by a sharp angle at the outside of the pubic spine, and ascends outwards, closely attached to the back and upper edge of Poupart's ligament to the upper front spine of the hip-bone, gradually increasing in width, and having a scythe-like shape, with the edge upwards and inwards, to the middle of that ligament, where it suddenly spreads upwards and is interposed between the back of the abdominal muscles and the front of the *peritoneum*, and is said to be lost on the diaphragm, which, however, is not really the case, for it continues as the connector of the *peritoneum* with that muscle, and then descending upon the front of the loins connects it with the lumbar muscles, and runs down upon the *iliacus* muscle on either side, between them and the *peritoneum*, and having attained those regions assumes the name of *fascia iliaca*, where for the present it must be left. I have said that the iliac portion of the *fascia transversalis* was scythe-shaped to the middle of Poupart's ligament, and it is there, about an inch in depth. It then runs inwards and descends behind the lower part of the straight muscles, is fixed to the back of the pubic bones, as far as their spines, spreads out on either side beyond them, behind and connected but slightly with the scythe-like portion, up to the upper front spine of the hip-bone; this from its attachment is called the pubic portion of the *fascia transversalis*, and its shape is more sickle-like, with the concavity upwards and outwards. The sudden turning inwards and downwards, and afterwards outwards and upwards of the pubic portion unconnected, or but loosely connected with the iliac portion of the *fascia transversalis*, leaves a gap about an inch and a half above Poupart's ligament, the hinder or inner abdominal ring, which has a sort of oval shape, or rather like the periphery of the vertical section of a pear.

That part of the pubic portion from below the inner ring to the spine of the share-bone, and behind the scythe edge of the iliac portion of the *fascia transversalis*, alone forms the floor or back of the inguinal canal, down to the upper edge of the external ring, but between this and its connexion to the spine, and *symphysis* of the share-bone, it is strengthened by the lower ends of the conjoined tendons of the internal oblique and transverse muscles, which descend in front of and closely connected with it, to be fixed from the spine to the *symphysis* of the share-bone, and thus together they shut like a window-shutter against the back of the external ring. A little shallow triangular groove extends from the internal to the external ring formed by the scythe edge of the iliac portion in front, and the pubic portion of the *fascia transversalis* behind, and in this as in a gutter lies the spermatic cord or the round ligament.

It must not be supposed that the inner ring is an actual aperture, except during the descent of the testicle, and then indeed it is only the orifice of a cellular pouch thrust down below the pouch of the *peritoneum*, which subsequently forms the vaginal tunic of the testicle; and when, after the arrival of that organ in the *scrotum*, the *peritoneum* upon the cord gradually closes and thins, so likewise does the pouch of the *transversalis facia*, forming the *fascia* of the cord, described by Astley Cooper long before Cloquet's account of it. In addition to this *fascia* from the inner ring a similar funnel of cellular tissue from the outer ring is given off as the cord passes through it, and the two *fasciæ* so called become confounded into one below, between the external ring and the testicle.

(2) The superficial *fascia* or *aponeurosis* of the external oblique muscle is not tendinous, but merely the cellular tissue which connects the skin with the front of the abdominal muscles, and descends upon the spermatic cord and testicle to connect them with the skin of the *scrotum*.—J. F. S.]

1187. At these two points inguinal ruptures are formed, and upon the difference in their origin depends their division into *external* and *internal*, or *oblique* and *direct* of English surgeons).

1188. *External or Oblique Inguinal Rupture* (*Hernia inguinalis externa*, Lat.; *Äüssere Leistenbruch*, Germ.; *Hernie inguinale externe*, Fr.) commences at the seat of the obliterated canal of the vaginal tunic, or the intestines pass into the canal itself, which remains partially or completely open. This rupture proceeds from above and without inwards and downwards, in the direction of the spermatic cord, as a cylindrical swelling; the spermatic cord lies on its inner hinder side, and the epigastric artery passes under the neck of the hernial sac and upon its inner side; if it be returned, a peculiar gurgling is heard.

1189. *Internal or Direct Inguinal Rupture* (*Hernia inguinalis interna*, Lat.; *Innere Leistenbruch*, Germ.; *Hernie inguinale interne*, Fr.; *Ventro-inguinal Hernia* of Cooper) passes out of the inguinal pit directly from within outwards through the external inguinal ring; it has a peculiar rounding, a short neck; it raises the inner pillar of the abdominal ring considerably; the spermatic cord lies on the outer side of the swelling; no gurgling is heard on its return.

1190. The symptoms by which external and internal inguinal ruptures are distinguished from each other, are only certain at the commencement of their existence, and whilst they have yet no great size. When the external inguinal rupture has become very large, it completely loses its cylindrical form, its oblique narrow neck, and passes directly out of the cavity of the belly. The position of the spermatic cord in old ruptures is equally various; not unfrequently are the vessels separated from each other by the pressure of the swelling.

1191. External or oblique inguinal rupture passes through the hinder (inner) inguinal ring into the general vaginal tunic, and may descend to the testicle, the proper vaginal tunic of which it touches. Its own coverings therefore are, 1, the skin of the *scrotum;* 2, the *fascia superficialis;* 3, the *tunica vaginalis communis*, upon the upper surface of which spread the fibres of the cremaster muscle; 4, the hernial sac itself, an unnatural lengthening of the *peritoneum*, covered on its outer surface with loose cellular tissue. In old ruptures these layers are often of considerable thickness.

Sometimes the external inguinal rupture does not pass through the front inguinal ring, but remains lying in the inguinal canal; it is then called *imperfectly developed inguinal rupture* (*Rupture in the inguinal canal* of English surgeons.) It forms in (above) the middle of Poupart's ligament, above (before) the crural artery, a round or obliquely oval swelling, which becomes larger by coughing, is accompanied with an unpleasant sensation of pressure and dragging, and easily thrust back on application of the finger. The external inguinal ring is free. If the rupture increase, it descends obliquely inwards and downwards, towards the external inguinal ring, and passes through it. But it often exists as an undeveloped inguinal rupture, and spreads upwards and outwards. Besides the coverings already mentioned, this is covered with the front wall of the inguinal canal; to wit, the tendon of the external oblique, and the muscular fibres of the internal oblique muscle (1).

[(1) It is not covered by the muscular fibres of the internal oblique, for as soon as the rupture is formed by protruding through the upper or internal abdominal ring, the muscular edge of the internal oblique and transverse muscles slips back, and rests upon the upper and back part of the swelling.—J. F. S.]

1192. The internal or direct inguinal rupture projects at the inguinal pit, either between the fibres of the *fascia transversalis*, and the thin bundles of the internal oblique abdominal muscle, or protrudes with it the *fascia transversalis;* it drives down external to the vaginal tunic into the *scrotum*, and if it sink lower than the spermatic cord, the testicle rests upon the fore or outer part of the body of the hernial sac. The coverings of this rupture are, 1, the skin of the *scrotum;* 2, the superficial *fascia;* 3, sometimes some bundles of the cremaster muscle (*a*); 4, sometimes the transverse *fascia* (*b*); 5, the hernial sac, with its external surface covered with loose cellular tissue.

(*a*) As long as internal inguinal rupture is not far from the abdominal ring, it is not covered with the cremaster; but in great protrusion it can incline farther outwards, and then it is possible that some fibres of the cremaster may appear on it, beneath which it simultaneously slips down.

(*b*) This usually appears to be the case, and the cause why the internal inguinal rupture can never attain the size of the external.

1193. It must be considered as a strong disposition for inguinal rupture if there be only a partial remaining open of the upper part of the vaginal canal for the outer, and a great elevation of the duplicature of the *peritoneum*, in which the umbilical artery lies, for the inner inguinal rupture.

1194. The *ileum* is the most common intestine in inguinal rupture, next it the *cæcum* and its wormlike process. If the *cæcum* or *colon* protrude, the ligaments are lengthened which connect them to the *peritoneum*, and also that part of the *peritoneum* which is connected with the intestines is drawn down, so that between the hernial sac and the intestines there is the same natural connexion as existed in its previous position. In these ruptures of the *cæcum* and *colon*, part lies externally to the sac, as in the belly it had lain external to the *peritoneum*. In general the hinder or under part of its calibre is protruded; as it drops down however the intestine often twists, so that its bare part lies in front, in which case the rupture seems to have no hernial sac. The *omentum* commonly passes into an inguinal rupture, especially on the left side. With the internal inguinal rupture a portion of the urinary bladder sometimes protrudes, which cannot be drawn from the sac. In rare cases, in women, the internal generative organs are contained in inguinal rupture. Inguinal ruptures are much more frequent in men than in women. The frequency of internal to external inguinal ruptures is as one to fifteen.

1195. If the intestine pass *into the still open canal of the vaginal tunic* of the testicle, it is called a *Congenital Inguinal Rupture* (*Hernia inguinalis congenita seu processus vaginalis*, Lat.; *angeborner Leistenbruch*, Germ.; *Hernie inguinale congénitale*, Fr). The origin of congenital inguinal rupture depends, in addition to the vaginal tunic remaining open, upon special causes:—*first*, on the long continuance of the testicle in the external inguinal ring, because then the vaginal canal has less disposition to be obliterated; *second*, after birth the protrusion is always favoured by respiration and by the action of the abdominal muscles; *third*, by adhesion of the testicle with the *omentum*, or with the intestine, previous to its descent, or if the intestine be connected with the *peritoneum*, as the *cæcum* on the right side, it may be drawn down with it.

1196. Congenital inguinal rupture has the same relations as external

or oblique inguinal rupture, but is distinguished by the following circumstances, *first*, the common external inguinal rupture does not descend over the place where the general vaginal tunic is connected with the testicle; in congenital rupture the intestines touch the testicle, and can thrust it upwards and backwards; *second*, congenital rupture develops itself more as the hernial sac is not formed by the early gradual elongation of the *peritoneum*.

1197. The coverings of congenital inguinal, are the same as those of external or oblique inguinal rupture, except that the hernial sac is formed by the *tunica vaginalis propria*. In rare cases a second lengthening of the *peritoneum* may descend into the still open canal of the vaginal tunic, by which the intestines descending into this sac are separated from the testicle (*a*). The congenital inguinal rupture is mostly intestinal, because the *omentum* is very short; it may however contain a portion of *omentum* if it have been adherent to the testicle in the belly (1).

Narrowing of the hernial sac occurs most frequently in congenital inguinal ruptures, and consequently often several nearly perfectly closed hernial sacs are formed (*b*).

[(1) This is Astley Cooper's *Encysted Hernia of the Tunica Vaginalis*, in which "on opening the *tunica vaginalis*, instead of the intestine being found lying in contact with the testicle, a second bag or sac is seen enclosed in the *tunica vaginalis*, and enveloping the intestine. This bag is attached to the orifice of the *tunica vaginalis*, and descends from thence into its cavity; it generally contracts a few adhesions to the *tunica vaginalis*, whilst its interior bears the character of a common hernial sac." Cooper considers that in this case "the *tunica vaginalis*, after the descent of the testicle, becomes closed opposite the abdominal ring, but remains open above and below it. The intestine descends into the upper part, and elongates both the adhesion and *tunica vaginalis*, so as to form it into a bag, which, descending into the *tunica vaginalis* below the adhesion, and becoming narrow at its neck, though wide at its *fundus*, receives a portion of intestine. * * * The disease does not appear like *hernia* of the *tunica vaginalis*, as the *testis* is not involved in it, but can be distinctly perceived below it. * * * The strangulation arises from the contracted state of the mouth of the hernial sac." (pp. 79–80.)]

1198. Various swellings which occur in the inguinal region must be distinguished from ruptures; such are *hydrocele*, *varicocele*, *inflammatory swelling of the spermatic cord*, *arrest of the testicle at the abdominal ring*, *collections of fat in the cellular tissue of the spermatic cord*, *collection of pus*.

1199. It is hardly possible to mistake a collection of water in the *tunica vaginalis propria* for a rupture. If the *hydrocele* be large, it may extend up to the abdominal ring and seem to penetrate within it, but if the swelling be drawn a little down, it will be seen that it does not lie in it, and that the ring is in its natural condition. In *hydrocele* the swelling ascends gradually towards the abdominal ring. The functions of the intestinal canal are undisturbed; lying on the back and coughing have no effect on the swelling. Congenital *hydrocele*, where indeed water is collected in the canal of the vaginal tunic, has greater resemblance to rupture; however, the consistence of the swelling, its transparency, its

(*a*) Hey, Practical Observations in Surgery. London, 1814, p. 226.—Cooper Astley, above cited. Meckel, Handbuch der Pathologischen Anatomie, vol. ii. pt. i. p. 379.

(*b*) Chelius, Ueber Verengerung des Bruchsackes bei angebornen Brüchen; in neuen Chiron. vol. i. pt. i.—Liman, Beobachtungen über das normwidrige Verhalten des Bruchsackes; in Journal von Graefe und von Walther, vol. v. pt. i. p. 97.

more easy or more difficult reduction, its quicker or slower reprotrusion, give the explanation (1). The diffused collection of water in the cellular tissue of the spermatic cord (*Hydrocele tunicæ vaginalis communis*) has the greatest resemblance to an omental rupture. The swelling which originates along the spermatic cord is broader below than above, seems to diminish on slight pressure, though it recurs immediately the pressure is withdrawn on lying down and standing up. If there be fluctuation, it is only at the bottom; if the bottom of the swelling be pressed, the fluid gently rises towards the apex, and expands it. If the swelling be within the abdominal ring, it stretches it; the patient often feels a pain at some part, and a dragging in the loins. As a distinctive character from omental rupture, it must be remembered that *hydrocele* of the cord has less consistence and a less irregular surface than omental rupture; it is also usually somewhat broader at the base, whilst in omental rupture the contrary occurs (*a*).

[(1) Although hydrocele of the common kind, namely, that in the vaginal covering of the testicle itself, cannot, without great carelessness, be mistaken for scrotal rupture, as its slow formation, its commencement from below instead of above, and its transparency sufficiently characterize it; yet if the hydrocele be situated in the cord itself, it may, at first sight, be thought to be a hernial swelling, especially as it seems to begin at the top instead of the bottom of the *scrotum*, and the patient's account of its origin is often very confused. I have seen three or four cases of this kind, and the last which I had under my care presents a very good example of the usual occurrences in this complaint

Case.—W. H., aged thirty-five, a healthy carpenter was admitted *May* 30, 1845, and says he had never any swelling in his groin till three weeks since, when, as he was lifting a heavy weight, he suddenly felt something snap in the left groin; but he suffered neither pain nor uneasiness, and continued his work during the rest of the day without further noticing it. On rising next morning, however, he observed a small tumour about the size of a filbert, in the left groin, which he says entirely disappeared when he was lying down on his back, and was capable of reduction when he stood upright. He was told the swelling was a rupture, and advised to wear a truss, for which he applied to a maker, who being unable to return the swelling, applied the truss upon it five days ago; from which to the present time he has continued to wear it, but the swelling increasing in size and becoming painful he applied to a practitioner, who considering the disease to be an irreducible rupture sent him to the hospital. The swelling was in the course of the left spermatic cord, about the size of a hen's egg, and extended up to the external ring and down to the testicle; above it the cord could be grasped, the finger and thumb almost meeting; it was firm and elastic; very tender to the touch (probably from the irritation of the truss); and a portion of it about the size of a walnut, was transparent. From these circumstances I was led to believe it a hydrocele of the spermatic cord. Some, however, might suppose, as it arose so suddenly, that the swelling was caused by tearing of one or more lymphatic vessels whilst he was exerting himself. Nothing further was done than applying hot flannels to the swelling, keeping him in bed, and giving him a dose of opening medicine. In the course of six days it had diminished to the size of a nut, and at the end of a fortnight had entirely disappeared.

A boy aged six years, was brought to the hospital *May* 5. 1838, considered to have strangulated rupture. He has worn a truss for several years. His bowels have not been moved for the last three days, and he has vomited several times, but not since yesterday morning; neither has medicine, which he then took, been rejected, although it has not operated. The right side of the *scrotum*, as far as the *rophe*, is distended with fluid, semi-transparent and œdematous; its shape flat, and much the form of the testicle; it is firm, but indents on

(*a*) Scarpa, Sull' Ernie Memoire Anatomico-chirurgiche. Milan, 1809. fol.—Ib., A Treatise, on Hernia translated; with Notes by Wishart Edinburgh, 1814. 8vo. p. 97.

pressure of the fingers, and reaches up to the abdominal ring, where it narrows. I could not satisfy myself as to the existence of any rupture, but thought it had the appearance resembling what I should suppose a burst hydrocele might assume. His mother took him away, promising to bring him back; but he never returned.

Very recently a similar case to the first was received into the hospital, and as in it, the cord could be grasped between the swelling and the external ring; but some doubt of its nature being entertained, a cut was made into it, some straw coloured serum escaped, and the cyst found to be closed and quite free from the belly.

Sometimes these hydroceles of the cord may result from the patient having worn a truss sufficiently long to produce adhesion of the mouth of the sac and shut off the lower part from the belly without its cavity being obliterated. Sometimes after the adhesion of the mouth of the sac, it may be again thrust down, either partially along the cord, in which case there may be a collection of water in the old sac, between the new one and the testicle; or the newly protruded sac may descend before the vaginal covering of the testicle, and carrying down with it the old sac, the latter may become situated between the new sac and the vaginal coat of the testicle. This appears to me to be the case in two preparations in the rich collection of ruptures at St. Bartholomew's Museum; and these cases are further interesting, as both also have hydrocele of the vaginal coat of the testicle itself.

Sometimes a rupture is accompanied with a common hydrocele below it; but in more rare cases the hydrocele is in front of the rupture, and generally is not discovered till the operation is performed, when it is liable to produce confusion, and make the operator suppose he has mistaken the case.

Thomas Blizard appears to have been the first person who observed hydrocele in front of an inguinal rupture. His patient had been subject to bubonocele on the right side upwards of six years, and he had almost constantly worn a truss. During the last two years of this period, a swelling of the testicle on the same side, which seems to have been hydrocele, occurred, but after a few months disappeared, and left the testicle wasted and drawn up to the groin. "When first called to him," says Blizard (*a*), "I found a small bubonocele on the right side, and could distinctly feel the *testis* of the same side, but very small, lying at the bottom of the *hernia*, having an inclination forwards. * * * Twenty hours after the descent I performed the operation. Having dissected down to a membrane, which I considered to be the hernial sac, I punctured it at the upper part, and then laid it open its whole length. It extended within the ring, which to obtain room for examination, I dilated. Upon further inquiry, I found the *hernia* was situated more deeply, and that the membrane which I had laid open was the *tunica vaginalis testis*, extended by the hydrocele, which had entirely disappeared. I then of course dissected through this *tunica vaginalis* at the posterior part, and laid open the hernial sac, which contained a portion of intestine nearly black from strangulation." The stricture was at the mouth of the sac. "In this case the *hernia* must have been behind the cord." (p. 66).

Another example of this kind occurred to the younger Cline shortly after, and is mentioned by Astley Cooper (*b*). I witnessed this operation. "On making an incision, into that which was supposed to be the hernial sac, a fluid similar to that of hydrocele escaped, which it afterwards proved to be, for it was the *tunica vaginalis* which had been opened; on dilating this opening a little, a tumour presented itself, which was afterwards found to be from $\frac{1}{8}$th to $\frac{1}{4}$th of an inch thick, which being dissected through, a fluid resembling the first in colour, but of a fetid smell, came out. This tumour was found to be the *tunica vaginalis* of the cord, but much altered from the natural appearance by a quantity of lymph that had been effused, which gave it the appearance of India rubber; the intestine had adhered firmly to the adjacent parts, and the stricture was divided with (on) the finger. Mr. Cline thought it not advisable to attempt to break through the adhesions, so as to return the intestine, lest it might bring on a dangerous degree of inflammation." (p. 17). He did well. These cases are not so uncommon as formerly supposed, and many of our Museums in London possess two or more examples.—J. F. S.]

1200. *Varicocele*, when it has attained considerable size, has indeed some resemblance to omental rupture, the abdominal ring is not, how-

(*a*) Astley Cooper, above cited. (*b*) Above cited.

ever, stretched; the several strings of the swollen vessels are felt; if the swelling be compressed for a few moments between the fingers, without thrusting it back towards the belly, it almost entirely disappears; the whole mass of the testicle seems expanded into varicose vessels. In doubtful cases, let the patient be laid on his back, return the swelling, and press with the finger on the abdominal ring; this pressure will, when he rises, be sufficient to prevent the protrusion of the intestine, but not to suppress the flow of blood into the spermatic vessels.

1201. If an inflammatory swelling of the spermatic cord be developed spontaneously, the *diagnosis* is doubtful, so much the more, if injuries, as violent strains, blows, and the like, which equally cause ruptures, produce this inflammation. Such inflammatory swelling passes through the abdominal ring, descends to the testicle, which seems as it were confused with the swelling; it is elastic, painful, and manifestly enclosed by the inguinal canal. Fever comes on, the bowels may be drawn in to participate, suppression of their relief, disposition to vomiting and the like are produced. In such cases the *diagnosis* is more difficult, if previously there were a rupture which has become strangulated by the injury which has excited the inflammation of the cord.

1202. When the testicle only, at a late period, descends through the inguinal canal, or when, on account of the shortness of the spermatic cord, it remains in the canal, it may by the opposition which the walls of the canal offer it, become inflamed. If in examining the *scrotum*, only one testicle be found, the *diagnosis* is thereby determined. An imperfectly developed external inguinal rupture may exist at the same time with one testicle lying in the groin, the protrusion of which may cause the severest pain, by its pressure on the testicle, as I myself have noticed in one instance.

[(Key (*a*) mentions a case of strangulated inguinal rupture, in which the testicle had never descended lower than the external ring, in consequence of which "the shape of the swelling was peculiar; the *hernia*, instead of passing downward into the *scrotum*, turned, after emerging from the inguinal canal, over the tendon of the external oblique muscle, and appeared somewhat like a femoral *hernia*." (p. 25).

There is also an example of this kind in the Museum of the Royal College of surgeons; and at St. Bartholomew's there is an instance of a congenital rupture in the inguinal canal, in which the testicle also is still remaining.—J. F. S.]

1203. Fat may be collected in the cellular tissue of the spermatic cord, project from the abdominal ring, or may exist along the cord in the *scrotum*, and form a swelling, which otherwise is accompanied with scarcely any inconvenience. But a collection of fat may arise upon the front or hind surface of the *peritoneum;* in this enlargement the fat descends through the abdominal ring into the *scrotum*, and drags the *peritoneum* with it. These so-called *Fat-Ruptures*, which may be formed on different parts of the belly, have the greatest resemblance to omental ruptures, especially if they, as is frequently the case, can be reduced.

Collections of fat upon the surface of the *peritoneum* may protrude through the white line, through the interspaces of the muscles, or through the natural apertures of the belly. If these swellings be situated at or upon the white line, they rarely attain any considerable size; usually their size is from that of a nut to that of an egg. Some fatty granules, deposited on the outer surface of the *peritoneum*, are gradually received into one of the little openings or clefts formed by the fibres of the

(*a*) Memoir.

tendinous *aponeurosis*, where they by degrees grow and enlarge, become converted into a swelling with a neck, the root of which is attached to the *peritoneum*, the neck surrounded by the fibres of the *aponeurosis*, and the bottom spread beneath the skin. They are usually firmer when small, and penetrating through a small opening; on the contrary, of looser texture when large, and increasing without restraint. Often they seem to be reduced and got rid of, but often they are immoveable. The continual dragging to which they are subject not unfrequently produces a funnel-shaped projection of the *peritoneum* at that part where they arise, and thus they present a sac-like extension, surrounded by a fatty swelling, which, according to Velpeau, may cause a real rupture; this danger, however, Pelletan states, does not happen when a considerable quantity of fat is found around the soft swelling, for the purpose of preventing the entrance of intestine or *omentum* into this elevation of the *peritoneum*. These swellings are frequently surrounded with membranes which present perfect coats, and sometimes also contain cysts. The fatty ruptures usually produce neither pain nor other inconvenience, and often remain unobserved throughout the whole life; but if they lengthen deeply into the duplicature of the sickle-shaped ligament of the liver, they may produce great inconvenience, by actually tearing the liver and the *peritoneum* in the movements of the abdominal muscles. Fat-ruptures cannot with certainty be distinguished from omental ruptures, for if, as Scarpa affirms, they be usually tougher and less compressible, this character, however, loses all value in old and adherent omental rupture. Pelletan first pointed out the mechanism of the fat-rupture, when it descends through the inguinal canal. In three cases he found the fatty mass doubly enveloped in *peritoneum*, when the fatty swelling was attached entirely to the *peritoneum*, like the testicle in its descent; and in the protrusion of the fatty swelling into the *scrotum*, the *peritoneum* was drawn over it like a sheath. The fatty swelling in the *scrotum* has the same relations as the testicle in its vaginal tunic, being doubly covered by the *peritoneum*, to the one part of which it is firmly and to the other loosely attached. This sometimes also occurs when the fat-rupture passes out by any other of the natural openings in the belly. Although, however, fat ruptures be found in the *scrotum* without any peritoneal covering, the *peritoneum* is more or less withdrawn or not at all connected with them, if they be merely collections of fat in the cellular tissue of the spermatic cord. Although the cavities formed by the double lengthening of the *peritoneum* do not close, but communicate with the cavity of the belly, as does the cavity of the vaginal tunic in congenital rupture, yet the fatty mass usually fills the sac so completely, that very rarely does intestine of *omentum* descend with it and complicate the case. The distinction of this fat-rupture from true rupture is often very difficult. Its gradual growth, and its freedom from pain on pressure, even when very considerable, are characteristic symptoms; but their resemblance to omental ruptures has even deceived the most experienced practitioners. If severe colic or the like accompany such swelling, a mistake is the more easy, and is only first discovered in the operation (Scarpa, Cruvelhier, Ollivier).

Compare also on this subject Morgagni, De sedibus et causis Morborum, Epist. xlv. art. 10. Epist. 1. art. 34.

Pelletan, Clinique chirurgicale, vol. iii. p. 33.

Bigot, Dissert. sur les tumeurs graisseuses extérieuses au péritoine, qui peuvent simuler des Hernies. Paris, 1821.

Coates, R.; in Cyclopædia of Pract. Medicine and Surgery, edited by Isaac Hays. Philadelphia, 1834. vol. i.

1204. Collections of pus which pass along the spermatic cord, out at the abdominal ring, may diminish or disappear in the supine posture, and increase on coughing and any other exertion: the fluctuation, the presence of symptoms of *psoas* abscess or of *carics* of the vertebral column may, however, guide the practitioner.

1205. Inguinal ruptures must be returned in the same direction by which they have protruded, that is, the external or oblique from below upwards, and from within outwards; and the internal or direct, from below upwards and directly from before backwards.

1206. For the purpose of keeping the rupture up, a truss with a semi-

circular spring which closely surrounds one half of the *pelvis* is best. In the external or oblique inguinal rupture with a long neck, the pad must press upon the whole length of the inguinal canal; but in internal or direct rupture it must merely press on the external inguinal ring in the direction from before backwards. For the external inguinal rupture with a short neck the truss should be the same.

1207. The strangulation of inguinal rupture may be situated at the external or internal inguinal ring, in the neck of the sac, or in strictures of the body of the sac. If it cannot be removed by the general treatment above-mentioned, the operation must be performed with the following special objects: —

1208. The cut through the integuments should always be made, especially in large ruptures, in the mesial line of the swelling, on account of the possible displacement of the spermatic cord, and carefully, because there may be a rupture without a sac (1). In every very large external or oblique rupture the cut should be commenced above the abdominal ring, where the swelling is narrowest, and not further continued till it has been ascertained, by feeling with the finger, whether the spermatic cord do or do not lie upon the hernial sac. When there is much water in the sac, the opening may be made boldly. In addition to the signs already mentioned, (*par.* 1170,) of having laid bare the hernial sac, this circumstance still serves, that as the hernial sac is always connected with the pillars of the abdominal ring, the ring cannot be penetrated before the opening of the sac with the point of the forefinger. If the hernial sac be thin, it can be torn, by seizing it with the forceps; but if it be very thick, frequently a superficial layer only must be divided, by which it is rendered more transparent and rather bluish. In dividing the stricturing part, in well determined external or oblique inguinal rupture, the cut must be made *outwards*, towards the iliac spine, but in the internal or direct inguinal rupture, *upwards and inwards;* in those cases where it is doubtful of which kind the rupture is, *directly upwards*, parallel with the white line, so that the cut may form a right angle with the body of the share-bone. After the complete return of the intestine, the forefinger should be carried through the inguinal canal, into the belly, to ascertain that it is clear and that no portion of intestine remain in it. In imperfectly developed external inguinal rupture, if the strangulation be at the internal ring, the skin, the superficial *fascia* and the tendon of the external oblique muscle must be divided in the direction of the inguinal canal, outwards and upwards, and the seat of stricture cut into *outwards and upwards.*

(1) On account of the circumstances already mentioned, (*par.* 1192,) it is always of importance before operating on an old scrotal rupture on the right side, to consider whether the rupture be formed by the *cæcum* or the beginning of the *colon.* Besides the size and long continuance of the swelling, its knotty condition excites suspicion, which is probable, if the rupture have been slowly produced. So long as it was in the groin it was returnable, but no longer; at least it cannot be perfectly returned so soon as it has descended into the *scrotum*, when the patient, after digestion is ended, and a short time before the bowels are relieved, feels dragging and pressure in the rupture, as well as frequently colicky pains, which subside after going to stool, and if there be in the right iliac region a hollow corresponding to the size of the rupture. In this rupture the stricture only is to be divided, and the adherent intestine covered with compresses, dipped in a mucilaginous fluid, by which in general it gradually returns into the belly.

The various opinions upon the most proper direction for the cut into the stricture, in inguinal rupture, in order to avoid injuring the epigastric artery, have only by the correct anatomical knowledge of its different origin, attained the proper explanation. The direction of the cut obliquely *upwards and outwards*, as proposed by Louis, Morand, Sharp, Gunz, Pott, Bell, Sabatier, and others, is so far the most proper, as in external or oblique inguinal rupture the artery cannot be injured, and it is by far the most common. (*par.* 1194). As in the direction of the cut obliquely *upwards and inwards* towards the navel, according to Heister, Garengeot, Le Dran, Richter, Mohrenheim, Mursinna, and others; or *inwards towards the symphysis*, after Ludwig and Seiler, only in internal or direct inguinal rupture can the artery be avoided, but in external rupture it can and must be wounded, if it be not granted that thereby really only the internal pillar of the external inguinal ring shall be cut into. The direction of the incision *directly upwards*, proposed by Franco, Dionis, Petit, Camper, Rougemont, and others, was for that occasion the safest, and Astley Cooper (above cited,) still considers it the most proper and safe in all cases. Chopart and Desault gave the most important advice, always to make the cut *towards the side opposite the position of the spermatic cord*, advice, which the knowledge of the corresponding relative position of the spermatic cord and spermatic artery, and a presumption of the various kinds of inguinal ruptures, renders clear (2).

[(2) I do not think Chopart and Desault's counsel is the best that can be taken, if it mean any thing more than a caution not to divide the spermatic vessels, which no one would do but by the most gross carlessness. Practically speaking, however, I can say that I do not recollect having had or seen a single instance of operation interfered with by the position of the spermatic vessels, presuming that no pupil of Cline or Cooper would think of dividing the stricture in strangulated inguinal rupture in any other direction than directly upwards, and neither to the right hand nor to the left. For whatever may be said, it is impossible, I believe, to distinguish, without actual dissection, whether an inguinal rupture be oblique or direct, and therefore any deviation from the directly upward division is hazardous.—J. F. S.]

1209. *Congenital* inguinal rupture, in regard to its treatment, agrees entirely with that of external or oblique rupture. The radical cure here takes place earlier, by the constant use of a truss, as the canal of the vaginal tunic has a natural disposition to close; on which account strangulation mostly occurs from a stricture of this canal. The sac is often so contracted, even at its lower end, that the cavity of the vaginal tunic is entirely closed from the rest of the hernial sac. If a portion of intestine protrude with the testicle, it must be attempted carefully to draw down the testicle into the purse, and to keep up the rupture by the truss; if the testicle remain at or in the external or inguinal ring and will not descend, a truss, with a concave pad, must be carefully applied. Pressing back the testicle, recommended by many persons, is very painful and dangerous, as degeneration of the testicle may be caused by the pressure of the truss. If the rupture adhere to the testicle, and keeping up the former be very painful, an operation and division of the adhesion is indicated. If strangulation be present and the operation necessary, (which even in the first days after birth may happen,) it must be performed with particular caution, that the testicle be taken care of. Any adhesion between the testicle and the protruded parts must be divided. If water as well as intestine be contained in the congenital rupture, it can be determined, after having returned it with the intestine, and putting the finger on the ring by raising the patient, when the water first, and then by coughing or the like, the intestine protrudes. If in these cases a truss be applied, in most, the water is gradually absorbed.

1210. After completing the operation for inguinal rupture, and cleansing the wound, the edges of the skin should be brought together, with

some interrupted stitches, and between them strips of plaster applied, and covered with wadding; to the region of the inguinal canal a many-folded triangular compress is to be applied and kept in place with a T bandage. The patient should lie in bed on his back, with his thighs drawn up towards the belly, and supported by a bolster beneath the knees. The after-treatment is to be conducted by the rules already laid down.

1211. In the operation for inguinal rupture, *without opening the hernial sac*, after making the proper cut of the skin a small aperture is to be made in the tendon of the external oblique muscle, a little above the external inguinal ring, and a director introduced, with which it is sought to find the seat of stricture, and then it should be directed towards the outer or inner inguinal ring and the stricture divided with a knife introduced upon the director (Key); or the hernial sac is to be drawn a little down, whilst the muscles are raised by an assistant, and then the stricture being rendered visible in the opening of the tendon, should be divided (A. Cooper).

1212. External inguinal rupture may originate, in women, in the lengthening of the *peritoneum*, which sometimes accompanies the round ligament of the womb, and is comparable to *congenital* rupture in the male sex.

[This lengthening of the *peritoneum* was first described by Nuck (*a*) who called it a *diverticulum*, and said it was about half an inch long and not constant. Cloquet (*b*) speaks of it by the name of Nuck's canal, as "a cylindrical tube terminating in a point or in a rounded *cul-de-sac*, of which the length and size varies; sometimes, on the contrary, it is a little flask with a narrow neck which communicates with the belly," and that he has "found them not only in female *fœtus*, but also in young girls and women of all ages." (p. 41).

As to the frequency of congenital rupture in the female, Allan Burns says (*c*) that he has seen seven cases, in six of which he "found the anterior side of the inguinal canal deficient. * * * In one of the subjects with congenital *hernia* the sac did not escape from the canal; in five it had, from the peculiar state of the canal, descended along the thigh, assuming to a great degree the resemblance to crural *hernia*. * * * In congenital inguinal *hernia* the risk is that we must take the disease for crural *hernia*." (pp. 514, 15.)]

II.—OF FEMORAL RUPTURE.

(*Hernia cruralis*, *femoralis*, Lat.; *Schenkelbruch*, Germ.; *Merocèle*, *Hernie crurale*, Fr.)

Vrolyk. G., Arbeelding der vatern, welke in de operatie der dye-breuk by mannen behoven vermyd te worden. Amsterdam, 1800. 8vo. Translated into German as Abbildungen, welche man in der Operation eines männlichen Schenkelbruches zu schonen hat. Amsterdam, 1801. 4to.

Monro, A., Observations on Crural Hernia. Edinburgh, 1803.

Hey, W., Practical Observations in Surgery. London, 1803. Chapter III.

Cooper, A., Anatomy and Surgical Treatment of Crural and Umbilical Hernia.

Burns, A., Observations on the structure of the parts concerned in Crural Hernia; in Edinburgh Medical and Surgical Journal, vol. ii. p. 265.

de Gimbernat, A., Nuevo Metodo de Opera en la Hernia Crural. Madrid, 1793. 4to. Also translated as A new Method of Operating for the Femoral Hernia, by Dr. Beddoes. London, 1795. 8vo.

(*a*) Adenographia curiosa, cap. x. de peritonæi diverticulis novis.

(*b*) Recherches Anatomiques.

(*c*) Monro, A., Jun., M.D., Morbid Anatomy of the Human Gullet, Stomach, and Intestines. Edinburgh, 1811. 8vo.

Hull, Ueber den Schenkelbruch in von Siebold's Chiron., vol. ii. pt. i.
Breschet, Considérations anatomiques et pathologiques sur la Hernie fémorale, ou Merocèle. Paris, 1819.
Liston, Robert, Memoir on the formation and connections of the crural arch, and other parts concerned in Inguinal and Crural Hernia. Edinburgh, 1819. 4to.
Langenbeck, Anatomische Untersuchung der Gegend, wo die Schenkelbrüche enstehen; in his Neue Bibliothek, vol. ii. pt. i.
Schreger, Chirurgische Versuche, vol. i. p. 171.
Scarpa, Antonio, Sull' Ernie, Mem. Anatomico-chirurgiche. Ediz. nuova, 1819. The new articles translated into French by Ollivier under the title Supplément au Traité pratique des Hernies, &c. Paris, 1823. 8vo.
Walther, W., Commentatio anatomico-chirurgica de hernia crurali. Lipsiæ, 1820.
Manec, Recherches sur la Hernie crurale. Paris, 1826.
The writings of Scarpa, Hesselbach, Cloquet, and Langenbeck, already quoted.

1213. *Femoral Rupture* passes through the *femoral ring*, (*annulus cruralis*), usually on the inner side of the femoral vessels, (*internal Femoral Rupture*); in rare cases on the outer side (*external Femoral Rupture.*

The division of femoral rupture, into *external* and *internal*, is grounded on the observations of Cloquet (*a*), and Hesselbach (*b*), and is proved in opposition to the doubts of Boyer, Lawrence, Langenbeck, and others.

Logier (*c*) describes a new kind of rupture, which passes obliquely through Gimbernat's ligament, and the mouth of which is separated by a portion of that ligament, and by the umbilical artery from the femoral ring. The epigastric and obturator arteries originate from a common trunk.

1214. Poupart's *ligament* stretches like a cord from the upper front iliac spine, to the pubic *symphysis*, where it is fixed, as already described (*par.* 1186). Just as this ligament approaches the share-bone, it increases in breadth, so that by this broader portion, it is attached along the spine of that bone. This insertion runs inwards to a point; outwardly it is broader, and bounded by an edge, concave towards the femoral vessels, (Gimbernat's *ligament*). The space beneath Poupart's ligament outwardly, namely, the hollow between the upper and lower front iliac spines, and the ilio-pectinean eminence is filled up by the *m. iliacus internus*, and *m. psoas magnus*, so that only in the middle of Poupart's ligament, between the ileo-pectinean eminence, and the sharp edge of Gimbernat's ligament, there remains an oblong opening, the *femoral ring*, (*annulus cruralis*, Lat.; *Schenkelring*, Germ.; *anneau crurale*, Fr., the *inner aperture for the femoral vessels* of Hesselbach), which contains the femoral vessels, nerves, and lymphatic ganglions. The *m. iliacus internus*, and *psoas magnus*, are covered with a thin *aponeurosis*, *(fascia iliaca)*, which arises imperceptibly from the surface of the former, and lies immediately upon those muscles; the iliac vessels, and *peritoneum*, lie upon and are connected with it by loose cellular tissue. This *aponeurosis* is attached to the *linea innominata*, to the inner edge of the iliac pit, and to the hind edge of Poupart's ligament. Opposite the latter insertion, it terminates running into a point near the passage for the femoral vein. Another portion of this *aponeurosis* passes over the share-bone, behind the femoral artery and vein, towards the thigh, where it forms the hind part of the sheath in which the

(*a*) Above cited, p. 85.
(*b*) Der aussere Schenkelbruch; in Neue chiron., vol. i. p. 91.
(*c*) Archives Générales de Médecine, May, 1833.

femoral vessels are enclosed, and is fixed to the *fascia lata*. From this state of parts, the protrusion of the intestines is very difficult; however, the part between the inner concave edge of POUPART's ligament, and the femoral vein, is not entirely closed, but only filled up by a lymphatic ganglion, or by thick cellular tissue. This space is bounded above and before by POUPART's ligament; below and behind by the share-bone; inwardly by the concave edge of POUPART's ligament; and outwardly by the femoral vein. The thigh-sheath *(fascia lata)* has two distinct insertions at the front upper part of the thigh; it is firmly attached to the upper part of the share-bone, above the origin of the *m. pectineus*, which it overspreads, and further to the front part of the femoral ring. The former portion proceeds with the iliac *fascia* behind the femoral vessels; the second attaches itself to POUPART's ligament, though not throughout its whole length, for its insertion terminates at the inside of the femoral vessels, which it covers externally. In this region then the femoral vessels lie between the two layers of the *fascia lata;* the upper layer is connected below with the under, by which one opening is formed the *external opening for the femoral vessels* of HESSELBACH; the *oval cavity* of LAWRENCE, which, at the outer edge, presents a *semilunar edge;* the *femoral ligament* of HEY; the *falciform process* of BURNS.) In this outer hole the *vena saphena* passes. This aperture is larger in women than in men where it is entirely closed by a tendinous bundle of net-like tissue. Besides this aperture, there are still several little openings in the upper layer for the passage of vessels. A thick cellular tissue, or a thin *aponeurosis*, spreads over the *fascia*, and covers the *vena saphena.*

[This description of the parts concerned in femoral rupture does not accord with that usually received in England, nor is it correct according to our dissection.

It is a curious circumstance that the tendinous and cellular parts connected with femoral rupture seem to be a general repetition of those of inguinal; in both an aperture exists in the tendinous expansion over the parts, and in both a cellular funnel, less or more perfectly shut up and guarded by *peritoneum* exists.

POUPART's ligament, or the lower margin of the tendon of the external oblique abdominal muscle, has been already mentioned as stretching from the upper front spine of the hip-bone to the spine and *symphysis* of the share-bone, its two latter attachments or pillars being separated by the external abdominal ring. But on further examination, it is found that the attachment of this tendon is still more extensive, its connexion with the *pelvis* being continued outwards from the pubic spine about half an inch, and finishing by a half oval concave edge facing outwards, thus forming a triangular tendinous space, known as GIMBERNAT's ligament, which diminishes by its own breadth the opening from the belly to the thigh between POUPART's ligament in front and the *pelvis* from the pubic spine to the lower front iliac spine, which is also still further lessened upon the outer side by the conjoined mass of the *m. iliacus internus* and *psoas magnus*, as they pass from the *pelvis* into the thigh, to their insertion in the little *trochanter*. The space then actually left is scarcely more than an inch wide to the inner side of the junction of the hip and share bones, and consequently before and above the inner half of the *acetabulum* or hip-socket and a little to its inner side, and through it the femoral vessels pass. But this aperture, the *crural ring*, has further boundaries. As from POUPART's ligament, or the *crural arch*, as it is often called, is expanded above, the tendinous covering of the belly, below the upper front iliac spines, and of the *m. recti* upwards to the pit of the stomach having in it the external abdominal ring, so from the lower edge of the ligament descends an extensive tendinous expansion which encloses all the muscles of the thigh and is lost about the knee-joint, and commonly called the *fascia lata*. This sheath seems to begin by a sharp angle from the lower edge of POUPART's ligament, where GIMBERNAT's ligament ends above;

as it continues outwards it deepens, assuming a crescent or sickle-like shape, forming the falciform process, till it stretches down the whole length of the thigh. But before doing this, and at the distance of about an inch and a half from POUPART's ligament, corresponding also to the same distance from the oblique crease in the skin, which separates the belly from the thigh, it curves suddenly inwards and upwards, spreading as it rises in front of the *m. pectineus*, above the origin of which it is fixed into the *pelvis* as far as the pubic spine. A large opening of an irregular oval form is thus left in the otherwise complete tendinous sheath of the muscles of the thigh, and to it is given by LAWRENCE the name of *lower or anterior opening of the crural canal;* over the inner lower edge of which the great saphenous vein is seen mounting to enter the inside of the femoral vein, which with the great artery it accompanies, are here uncovered by tendinous sheath, but still covered in a peculiar manner.

It will be recollected that when speaking of the transversal *fascia* in the desciption of the parts of inguinal rupture, that its lower part at the bottom of the belly was mentioned as consisting of two portions, the front and outer or iliac portion continued along the margin of POUPART's ligament to the upper iliac spine, forming the outer half of the internal abdominal ring, then bending round behind the *peritoneum* and spreading over the front of the *m. iliacus internus* and *psoas magnus*, as they fill the ventral cavity of the hip-bone, and there assuming specially the name *fascia iliaca*. The hinder inner, or pubic portion of the transversal *fascia* was also mentioned as forming the back of the inguinal canal, and the inner half of the internal abdominal ring and then stretching away outwards in a sharp edge up to the spine of the hip-bone, behind the front portion, there terminated, and might with equal propriety be called *fascia pudica*, it being remembered, however, that neither it nor the so-called *fascia iliaca* are other than continuations or processes of the transversal *fascia*. In the angular track between POUPART's ligament in front, and the *m. iliacus* and *psoas magnus* behind and on the outer side, and the edge of GIMBERNAT's ligament and the angle of the share-bone, behind, and on the inner side, these the iliac and pudic portions of the transversal *fascia* unite in a kind of seam on each side, but separated in the middle at the gap formed by the crural arch for the passage of the femoral vessels. Thus far completes the description of the transversal *fascia* in the belly; part of which only, namely, that immediately connected with inguinal ruptures, had been described. It remains now to speak of this *fascia* as connected with femoral rupture.

The aperture behind POUPART's ligament, or the crural arch, and called by HEY the *femoral ring*, gives passage to the femoral vessels, which, whilst in the *pelvis*, lie upon the iliac portion of the transversal *fascia*, between it and the *peritoneum*, but reaching the crural ring, escape from behind the *peritoneum*, and then are placed between the just mentioned iliac portion of the transversal *fascia* behind, and its pudic portion in front. Here the iliac and pudic *fasciæ*, having joined so as to form a corresponding opening to the femoral ring, are continued down into the thigh, in the shape of a wide, but much flattened funnel, behind the *fascia lata*, but uncovered by it, as the funnel descends behind its oval opening, and containing within it the femoral vessels, is called the *femoral sheath*, the hinder or iliac portion of which descends only to the origin of the deep branch of the femoral artery; whilst its front or pubic portion, extends along the trunks of the femoral vessels till they penetrate the tendon of the *m. triceps adductor femoris*. A process passes from the front to the back of the sheath, along its whole length, dividing it into two distinct canals, in the outer of which is contained the femoral artery, and in the inner the femoral vein. Immediately above the lower edge of the oval opening of the *fascia lata* is an opening on the inside of the femoral sheath, through which the great saphenous vein penetrates to empty itself into the femoral vein. Above the former, the absorbent vessels penetrate, as ASTLEY COOPER (*a*) describes, "through the inner side of the sheath, near the *pubes*. In the male subject I have seen them enter the sheath in a cluster, through a single hole in this *fascia;* but in both sexes the *fascia* is generally rendered cribriform, by these vessels passing through a variety of small openings." (p. 9). He also further states, what I must confess I have never observed, that "if the sheath be opened, the contents will be found separated by *two* membranous *septa*, one passing between the artery and vein, and the second equally distinct be-

(*a*) Hernia, part i.

tween the vein and the absorbents. * * * The contents of the sheath differ in their attachments to the bag; the artery and vein are seen completely filling up the space in the sheath which is allotted to them; while the absorbents are loosely connected by means of cellular membrane and fat, which, not affording sufficient resistance to the pressure of the abdominal *viscera* occasionally allows the descent of a *hernia*." (p. 10). This portion of the sheath is commonly in health, called the cribriform *fascia*, and it is between it and the femoral vein that femoral rupture first enters the sheath, and then, protruding its inner side, has been called by ASTLEY COOPER the *fascia propria* of the rupture, a most inappropriate name, as it might lead to the supposition of a new formation instead of the simple protrusion of an old structure in these cases. In regard to this covering of the femoral sac, COOPER says:—"A thin *fascia* naturally covers the opening through which the *hernia* passes and descends on the posterior part of the *pubes*. When the *hernia*, therefore, enters the sheath, it pushes this *fascia* before it, so that the sac may be perfectly drawn from its inner side, and the *fascia* which covers it left distinct. The *fascia* which forms the crural sheath, and in which are placed the hole or holes for the absorbent vessels, is also protruded forwards, and is united with the other, so that the two become thus consolidated into one." (part ii. p. 2). CLOQUET also describes the closure of the top crural sheath in a very similar manner. "The upper orifice of the crural canal (sheath) is closed," says he, "by a membranous partition, which opposes the formation of crural rupture, as well as the entrance of the finger when pushed from above downwards, above the crural arch. This partition forms above the arch a sort of diaphragm-cellulo-fibrous, whitish, thick, and very resistant in some subjects; simply cellular, weak, and readily yielding in others. I propose giving it the name *crural septum*. It arises completely around the upper opening of the crural canal, is thickish, and its fibres are most commonly transverse in front, towards the crural arch. Within it proceeds from the cellular tissue behind GIMBERNAT'S ligament; or, rather, from the concave edge of that ligament itself, conjointly with the inner wall of the crural canal (sheath) itself. Externally it is blended with the femoral sheath, and the laminar tissue encircling the epigastric artery, on the outside of which cellular tissue fills the space between the crural arch and vessels. Its upper abdominal surface is concave; its lower, towards the crural canal convave; but sometimes both surfaces are flat. It always presents one or more apertures for the passage of the lymphatic vessels, and sometimes the upper part of the crural canal seems merely closed by a fibro-cellular net-work. One of these openings larger than the others, is central, and penetrated by an oblong lymphatic gland, and will admit the finger." (pp. 73, 4.) LAWRENCE says that he has not found, on dissection, either COOPER'S "thin *fascia*," or CLOQUET'S "membranous partition," and is "disposed to refer the origin of this *fascia propria* to the condensed fibrous substance, which completes the crural sheath on its inner or mesial side." (p. 478.) And with his views in this respect I fully concur.—J. F. S.]

1215. Although the femoral ring is a larger opening than the abdominal, yet femoral is more rare than inguinal rupture, because the intestines do not press so directly upon this part; it is not originally open, nor does any organ descend through it. Femoral rupture is more frequent in women than in men.

1216. Femoral rupture commences with a little roundish deep-seated swelling beneath POUPART'S ligament, which as it enlarges spreads aside, so that its base increases in breadth, and its greatest diameter corresponds to the oblique direction of the groin (1). The swelling never attains the size of inguinal rupture; it may, however, spread over the femoral vessels and nerves, and produce a sensation of numbness, or œdematous swelling of the foot of the affected side. In men, the distinction between femoral and inguinal rupture is easy, because the latter closely follows the direction of the spermatic cord; but in women it is more difficult, because the cord does not exist, and the abdominal is nearer the femoral ring (2). Femoral rupture is easily distinguished from a bubo, and from a collection of pus; the *diagnosis* is, however,

more difficult when the rupture is accompanied with a swelling of the glands (3).

[(1) Femoral rupture commonly after descending a little down and protruding the sheath inwards, turns upwards upon Poupart's ligament, so that the bottom of the sac is above the mouth. Astley Cooper, however, states that "it sometimes happens that instead of crossing the thigh in the direction of the crural arch, it extends downwards along the edge of the crural vein and the *vena saphæna major*. (p. 1). The tumour does not quit the sheath for the crural vessels. The appearance of this disease is that of a general swelling of the *fascia* on the inner side of the femoral vein, but without its producing any circumscribed tumour. The part swells whenever the patient coughs or uses any considerable exertion, but the swelling diminishes though it does not entirely subside, when he stands at rest. * * * I believe it to be not an unfrequent variety, as I have met with it three times in the dead body, and it existed on both sides in each. * * * It is continued downwards within the sheath, passing anteriorly to the femoral vein, and descends as far below the crural arch as the sheath will allow, the distance being in general from two to three inches." (p. 25). Callaway tells me one such case occurred under his care, and was at first supposed to be *varix* of the femoral vein, its true nature was, however, discovered, and a truss was applied with advantage.

(2) In ordinary cases I have never seen any difficulty of distinguishing femoral from inguinal rupture in women; and cannot conceive it possible, except whilst the latter is in the inguinal canal, or on the point of passing through the external abdominal ring, but even then it is not difficult to determine, as the swelling of femoral rupture can be pushed down into the thigh, and Poupart's ligament either thereby exposed or the fingers passed between the rupture and it, which cannot be done by pressing down inguinal rupture, as thereby Poupart's ligament is more hidden.

(3) Besides those here mentioned, there are other swellings in the upper part of the thigh or groin liable to be mistaken for femoral rupture. Astley Cooper mentions an enlargement of the crural vein, which dilated when the patient coughed, (in consequence of the return of blood into the belly, made by the pressure of the bowels upon the iliac veins,) disappeared in the recumbent, and reappeared in the erect posture. * * * It was easy to detect the nature of the case, for although it disappeared in the recumbent posture, it was immediately reproduced, although he continued in that posture, by pressing on the vein above the crural arch, and retarding the return of blood." (p. 4). Tumours also, either fatty or encysted, may occupy the seat of the rupture, and be mistaken for it. Of the latter there is an example in St. Thomas's Museum.—J. F. S.]

1217. The coverings of femoral rupture are, *first* the external skin; *second*, cellular tissue and glands; the layer of the former is often very thick and loaded with fat; *third*, the superficial layer of the *fascia lata* (1); and *fourth*, the hernial sac, the protruded part of the *peritoneum*, which is covered on its surface with a layer of loose cellular tissue.

These coverings are not the same in all cases; a rupture of increasing size may protrude through the aperture by which the *vena saphena* has entered, so that it is then for the most part covered only with skin and subjacent cellular tissue. Most commonly a portion of the *ileum* is included in femoral rupture, more rarely the *omentum*, and extremely seldom a portion of the bladder.

[(1) This is erroneous; the *fascia lata* never covers femoral rupture, which passes, as already mentioned, through the oval opening, and the third covering is the protruded *sheath of the femoral vessels*, as I have already described.

I recollect seeing Green operate on a case in which, when the so-called *fascia propria* was exposed, it had a nodulated form, and gave some idea of intestine covered only with its peritoneal sac; but on carefully cutting through, a mass of soft fat was found beneath it, under which was the sac.

In another case under my own care, having cut through the *fascia propria*, as seemed, I thought I had reached the peritoneal sac, and dividing it, a small quantity of fluid was discharged, which led me to suppose I had opened the sac, but what I

supposed to be intestine remained very immoveable, and led me to doubt. Upon examining what was thought to be mesentery I found the vessels running in all directions, and the part itself semi-transparent; I therefore carefully cut through it, and immediately about a table-spoonful of fluid escaped, and a knuckle of intestine was exposed.—J. F. S.

A very remarkable case of femoral rupture is mentioned by BERARD (*a*), which contained the Fallopian tube, and a large quantity of fluid. It had commenced two years previously in a small tumour, which was reducible, but she neglected wearing any bandage. In December, 1837, the growth had become more rapid, and the swelling, which was in the right groin, larger than a hen's egg, stretched somewhat towards the *abdomen* and right *labium*, with a broad base, and smooth surface, except on the inner upper side, where a nipple-like process, as big as the top of the finger protruded, and the skin covering it was thin and bluish. The tumour fluctuated, and was transparent, and she says returns into the belly when she lies down. It was presumed to be a serous cyst developed in the part, or an old hernial sac closed by adhesion at the neck, and become dropsical. She had also a hard round body, as big as a turkey's egg, protruding above the *pubes*, which on examination, by the *vagina* was found to originate from the womb. The first-mentioned swelling was punctured with a trocar, and six or eight ounces of citron-coloured frothy *serum* discharged, which coagulated with heat. A round body, as large as a small nut, and irreducible, was felt in the femoral ring and ceased to be felt behind the crural arch. On the fifth day after the operation the sac suppurated, and she died on the seventh. On *examination* the interior of this cavity was found lined with albuminous exudation, and it communicated by a free opening with the peritoneal cavity behind POUPART's ligament. It contained nothing but the Fallopian tube in a state of considerable hypertrophy, without adhesion to the interior of the sac, but closely united to the anterior part of the circumference of the sac. The tissue of the womb was healthy, except being distended by an enormous fibrous tumour.]

1218. The epigastric artery is on the outer side in internal femoral rupture, and ascends on the outer side of the hernial sac, where it crosses the spermatic cord, which runs on the upper and inner side of the rupture. The variations in the course of the epigastric and obturator arteries are here of the greatest importance. If the obturator artery arise from the external iliac or from the epigastric, or both from the crural artery, when it has passed below POUPART's ligament, the obturator artery runs along the inside of the hernial sac, down into the *pelvis*. In the same direction, frequently passes a not inconsiderable branch of communication from the epigastric to the obturator artery. The observations on the frequency of these different origins do not always precisely agree; the origin of the obturator artery is, however, almost more common from the epigastric, than from the internal iliac artery (*b*).

1219. The spermatic cord surrounds the upper part of the neck of the hernial sac, describing a semi-circle inwards, so that the neck of a femoral rupture lies between the epigastric artery and the spermatic cord, at an equal distance from both.

1220. Femoral rupture is often very difficult of reduction owing to its depth. The *taxis* must, in a small femoral rupture, be applied directly from before backwards; but in a large one, first from above downwards, and then from before backwards, the thigh being also much bent at the

(*a*) L'Expérience, April, 1839.—British and Foreign Medical Review, vol. x. p. 267.

(*b*) CLOQUET, above cited.—HESSELBACH, A. K., Ueber den Ursprung und Verlauf der unteren Bruchdecken Schlagader und der Hüftbeinloch Schlagader. Nachtrag zu seiner Schrift: Ueber die sicherste Art des Bruchschnittes in der Leiste. Bamberg und Würzburg, 1819, 4to.; with six Engravings. —TIEDEMANN, Erklärung seiner Abbildungen der Pulsadern, p. 288–298.

groin. The fingers of both hands are to be applied on the swelling, and attempts made gently, but continuously, to return the parts. In order to keep the femoral rupture up, a similar bandage to that used in inguinal rupture is employed, only with a shorter neck, because the femoral ring is nearer the iliac spine, than to the front inguinal or external abdominal ring. The direction of the neck of the bandage must correspond to that of POUPART's ligament to wit, from the side towards the share-bone. The edge of the pad must not descend over the bend of the groin.

1221. Femoral rupture may be strangulated in the external or in the internal aperture for the vessels; the strangulation is generally very severe, and if reduction cannot be effected, the operation is soon indicated.

The strangulation may also be situated in the neck of the sac, especially if a truss have been worn for a long time. JAEGER's assertion (*a*) that no case of strangulation by the neck of the sac is known, I must deny. I would add, that in two cases the reduction of the intestine was impossible, although the femoral ring was so considerably cut into that the finger could be readily passed into it, and turned about in every direction. In both cases the strangulation was in the neck of the sac, after the division of which the bowel was easily reduced.

[KEY considers the usual seat of stricture in femoral rupture to be "a tendinous band, which joins the *fascia transversalis* to the posterior margin of POUPART's ligament, and which is quite distinct from GIMBERNAT's ligament, upon which so much stress is laid by some as constituting the stricture." (p. 14, *note*, part ii.)]

1222. The cut through the skin in the operation for femoral rupture should have an oblique direction, corresponding to POUPART's ligament, and should extend half an inch over the swelling towards the iliac spine and the pubic *symphysis*. The cellular tissue is then to be divided as described (*par.* 1170) in the direction of the cut in the skin. The subjacent fat, which in stout persons is often very considerable, has a peculiar consistence, and often a resemblance to a piece of *omentum*, must be carefully separated from the bands, and the upper layer of the *fascia lata* cut through (1); the hernial sac is then to be exposed and opened. A case may occur in which the rupture protrudes through the opening of the upper layer of the *fascia lata*, in which instance, by cutting through the skin and cellular tissue, the operator comes at once upon the hernial sac. The opening of the hernial sac requires the greatest care, as there is always but little fluid, and frequently only a small loop of intestine uncovered by *omentum*.

The oblique cut, corresponding to the great diameter of the swelling, (SCARPA, ZANG, and others), is in general most suitable, because by dividing the upper layer of the *fascia lata*, POUPART's ligament is at the same time relaxed. In large swellings, or in stout persons, a T-shaped (COOPER, LAWRENCE, and others) or a transverse incision (PELLETAN, DUPUYTREN) may be made. The directly vertical incision is objectionable.

[(1) It must not be forgotten that what CHELIUS here and elsewhere calls the upper layer of the *fascia lata* is really the femoral sheath.—J. F. S.]

1223. If the strangulation be caused by the outer aperture of the femoral vessels, or by the opening of the external layer of the *fascia lata*, the tendinous edge of this aperture must be carefully cut into. If the strangulation be in the femoral ring, different modes of treatment are proposed.

(*a*) Handwörterbuch der Chirurgie, vol. iii. p. 591.

(*a*.) In women the point of the forefinger or the director should be introduced between the neck of the hernial sac and the intestine, the button-ended bistoury passed upon it, and the inguinal ligament cut into inwards and upwards.

(*b*.) In men the button-ended bistoury should be introduced upon the director which has been passed on the inside, to protect the spermatic cord, and the inguinal ligament should be divided horizontally inwards, or rather a little obliquely upwards, two or three lines deep (Scarpa). Dupuytren cuts obliquely from below upwards along the edge of the outer inguinal ligament, in the direction by which the spermatic cord descends.

(*c*.) For the purpose of more surely preventing the injury of the epigastric or obturator artery, Arnaud's hook should be introduced under the inguinal ligament, so as to draw it obliquely up towards the navel, whilst the power of the pull should be kept up by the finger introduced beneath Poupart's ligament, and the intestine pressed back. If the inguinal ligament be not thereby sufficiently stretched, some slight cuts, only a line deep, must be made in its edge, and then it must be raised up with Arnaud's hook (Schreger). In the same way Le Blanc's dilator is to be used. Also by introducing the forefinger between the inner surface of the hernial sac and the edge of Gimbernat's ligament, the latter may be stretched, or even torn (Rust and others) (*a*).

For an account of the numerous modes of proceeding in the operation for femoral rupture, see

Schreger, Grundriss der chirurgischen Operationen, vol. i. p. 254. Third Edit.

1224. The danger, which, in the above-described course of the obturator and epigastric arteries, is run from the practice *a* and *b*, on account of the injury of these vessels, the favouring of the recurrence of a rupture by the bloodless expansion, according to *c*, further, the circumstance that the parts suffer considerable bruising, and the mere extension in many cases is not sufficient for the removal of the strangulation, have decided Hesselbach to the practice (which in a manner resembles the earlier practice of Bell, Else, and others) of seizing the exposed lower edge of the inguinal ligament with the forceps, and cutting into it layerwise, from below upwards, two lines deep, and to introduce the forefinger between the intestine and the seat of strangulation. If the cut be insufficient, it must be lengthened through the fibres of the *aponeurosis* of the external oblique abdominal muscle above the spermatic cord, which is raised by an assistant, and the inner inguinal ligament should be cut into in the same way (*b*).

1225. This practice, although safer, on account of the deep situation of the femoral ring, especially in stout persons, is accompanied with great difficulty. That proposed by Scarpa and Dupuytren seems perferable to all other, if attention be paid to the following circumstances; the point of the forefinger is to be so introduced between the protruded part and Gimbernat's ligament, so as to bring the nail behind its sharp edge; Cooper's hernia-knife with the probe point, is to be passed upon

(*a*) Trustedt, Ueber die Vorzüge der Ausdehnung vor dem Schnitte bei der Operation des eingeklemmten Schenkelbrüches; in Rust's Magazin, vol. iii. p. 227.

(*b*) Hesselbach, A. K., die sicherste Art der Bruchschnittes in der Leiste. Bamberg und Würzburg, 1819.

the finger, behind the sickle-shaped edge of GIMBERNAT's ligament, so that the edge does not extend above it. The edge is then to be pressed by the front of the finger against the ligament, so as to effect its division by pressure, and not by drawing. A smaller cut of one or two lines' extent is often sufficient for the reduction of the protruded parts, by slightly pressing in with the finger. If this be insufficient, the incision must be repeated (*a*).

[The division of GIMBERNAT's ligament is useless; the stricture in femoral rupture is almost invariably in the neck of the sac itself, which must be divided, or the rupture will not return.

In operating on femoral rupture, without opening the sac, KEY observes:—"It may be as well to disturb the subjacent cellular membrane as little as possible, as inflammation is less likely to follow, and to assume the form of erysipelas. For this reason the inverted T incision, usual in the operation for femoral *hernia*, may be in most cases reduced to a single incision, either at right angles to POUPART's ligament, or in a transverse direction across the tumour. In patients who are spare, and in whom the neck of the sac lies at no great depth from the surface, it is unnecessary to disturb the cellular membrane by turning aside the flaps of the integuments. This will diminish the suppurative inflammation, and in such cases will afford ample room for the operation. I have not made trial of the perpendicular form of incision, but a single transverse one I have found sufficient when the integuments have been loose and the tumour not large. The superficial *fascia* adheres firmly to the common integuments, and is usually turned aside with them, especially when the latter are pinched up for the purpose of making the first incision. The *fascia propria* is therefore quickly exposed, and forms the first distinct covering of the tumour, being darker than the more superficial cellular investment. It is under the outer layer of this *fascia* that the adipose structure is formed, and which often assumes the appearance of *omentum*. The director easily makes its way under this fatty matter as far as the neck of the sac, which lies deeper than the operator at first supposes. The point of the director should be applied rather to the inner than to the outer part of the neck of the sac, as it will be found more easily to pass under the stricture at this part. It should not at first be attempted to be thrust under the stricture, as the firmness of the parts forming the stricture would resist it. But the seat of the stricture being felt, the operator should depress the ends of the director upon the sac, which will yield before it, and then, by an onward movement, the director slides under the stricture." (pp. 143, 44.)]

1226. The return of the intestine, the dressing and the treatment after operation are to be conducted in the same way as already described in inguinal rupture.

1227. The *external femoral rupture*, which consists in the protrusion of the *peritoneum* and of the *fascia iliaca* on the outside of the femoral vessels, between them and the front upper angle of the hip-bone, and is gradually developed, forms at the place mentioned a moderately raised swelling, which, becoming narrower below, ascends, however, obliquely inwards, and terminates with a blunt point in the region of the lesser *trochanter*. The finger cannot in the least be brought under either of its edges. If in its further growth the rupture overcome the anterior iliac *fascia*, the form and direction of the swelling is changed; a new one is developed beneath the old swelling, which always extends further between the *fascia lata* and the muscles of the thigh. The mouth of the rupture is formed by the outer part of POUPART's ligament and the iliac spine; on its inner side lies the femoral artery, and upon it the circumflex iliac artery. The neck of the sac is the widest part of it lying within

(*a*) SCARPA, above cited.—LANGENBECK, above cited, p. 80.—RICHERAND, Histoire des Progrès recens de la Chirurgie, p. 62.

the belly; its inner wall lies under the semi-lunar bridge of the posterior iliac *fascia*, its outer on the *m. iliacus internus* and *psoas magnus*. The body of the sac lies behind the anterior iliac *fascia*, near it outwardly lie the *m. rectus* and *vastus externus femoris*, near it inwardly the femoral vessels and nerves, partially covered by it, and upon or before it the *m. sartorius* and part of the *fascia lata*. The bottom of the sac, its narrowest part, lies on the *trochanter minor*. The coverings of this rupture beneath the skin are, *first*, the femoral ligament upon the inner greater half, and the *m. sartorius* upon the outer lesser half of the hernial sac; *second*, a layer of tough cellular tissue, in which small blood-vessels and nerves run; *third*, the anterior iliac *fascia; fourth*, the posterior iliac *fascia*, which is very delicate, and allows, *fifth*, the hernial sac, which it completely envelopes, to show through. Hesselbach considers a weak constitution, and the existence of the *m. psoas minor*, by which a cup-like hollow is formed, as disposing to this rupture. As long as this rupture is enclosed in the anterior iliac *fascia*, it cannot well be strangulated, because the neck is the widest part of the sac; but if that *fascia* be torn by great violence, then, according to Hesselbach, strangulation may follow. The *taxis* is to be applied from below upwards; and if the operation be necessary, it is only possible, according to Hesselbach, to avoid wounding the circumflex iliac artery, which always lies in front of the neck of the sac, by the division layer-wise of the strangulating parts (*a*).

[Astley Cooper observes, that "it is by no means common to meet with deviations from the usual structure of crural hernia," and describes three varieties; *first*, that in which "the fascia usually covering the hernial sac has given way so as to allow a portion of the tumour to pass before it; thus dividing the tumour into two parts, with a sort of hour-glass contraction between them," (p. 25, part ii.) very similar to which appears Hesselbach's case, quoted by Key, where "the sheath had given way in different parts so as to give the sac an appearance of five small tumours, which was probably owing to the apertures through which the absorbents pass having yielded, while the general texture of the sheath had resisted pressure." (p. 25, *note*, part ii.) *Second*, "when the tumour does not quit the sheath for the crural vessels." *Third*, "that in which the *hernia* is formed in part within the sheath, and also in the common way." (p. 25, part ii.)

I have had three cases of femoral rupture which seem distinct from either of those mentioned, and were furnished with a second sac, produced, I presume, by rupture of the original one.

Case 1.—S. B., aged fifty-six years, a stout, healthy, but flabby woman, was admitted into St. Thomas's Hospital on the afternoon of

Sept. 23d, 1837, having been subject of rupture on the right side for the last nine years, during the latter four of which she has worn, though irregularly, a cup-truss, as the protrusion could not be entirely returned. Within the latter period the rupture has descended so largely five times as to cause severe vomiting, but has been relieved. On the 20th *ult.* her bowels were moved, and not since. Next afternoon she was attacked with severe vomiting, and yesterday the *taxis* was employed severely, but without relief, and the symptoms continued up to the period of her admission, when she was immediately put in the warm bath, which produced complete prostration, and attempts at reduction were made, but without success.

In the *evening* I saw her, and she had then recovered the effects of the bath, but she was vomiting stercoraceous matter, had continual eructations, and hiccough, which had been through the whole day, otherwise she was tranquil, and her countenance cheerful. The belly was tender, but not much distended.

A large oblong tumour extended from the pubic spine to within an inch of the

(*a*) Hesselbach above cited, and his Lehre den Eingeweidebrüchen, vol. i. p. 172.—Zeis, Dissert. Herniæ cruralis externæ historia. Lipsiæ, 1832.

upper front iliac spine, about three fingers in breadth, covering POUPART's ligament, and having the appearance of an enlarged mass of inguinal glands, very firm and unyielding, and the skin covering it very livid, from the previous severe handling. A second swelling occupied the place of femoral rupture, not exceeding the size of a walnut, separated from the former by the crease of the groin, and rather nearer the *pubes* than usual. This seemed without doubt a femoral rupture, and gave a sense of indistinct fluctuation when the swelling on the groin was pressed. I was in much doubt of the character of the larger swelling, whether it were a mass of enlarged glands further swollen and inflamed by the handling, or whether an encysted tumour, or whether a rupture; but neither its history nor situation led to the latter supposition.

As the swelling had been so severely mauled, I thought it best not to make any violent or long-continued efforts to return the rupture, and, not succeeding, proposed to her an operation, to which, however, she would not consent. The symptoms continuing throughout the night, and her countenance becoming anxious, she was at last persuaded to submit; and after consultation with my colleague GREEN, on the following day, *Sept. 24th, noon*, I proceeded to operate on the smaller tumour, in the same way as for femoral rupture. Nothing unusual occurred except that, on opening the sac. no fluid escaped; a portion of *omentum*, about as large as a walnut, turned out, but no intestine could be found. I then passed my finger up towards the mouth of the sac, into the aperture of which I could just introduce it. No alteration having taken place in the tumour on the groin, and the *omentum*, in the sac just opened, seeming scarcely sufficient to account for the severity of the symptoms of strangulation, we determined on narrowly examining the sac, to ascertain whether it communicated with the large swelling. In carrying my finger round the hernial cavity for this purpose, it suddenly passed into an aperture on the outer side, and, being pushed onwards, entered the large swelling, and passing along it nearly as far as the iliac spine, could be readily felt, and not deeply, beneath the skin, which was then slit up on my finger, and thereby a large mass of healthy *omentum* exposed, which, being raised, about four inches of small intestines, chocolate-coloured and bright, but with a few patches of adhesive matter beneath its peritoneal coat, which also adhered slightly to the *omentum*, came into view. The mouth of the sac was speedily found, and my finger with little difficulty passed into the belly; but the gut would not return till the aperture had been enlarged with the knife. About four ounces of *omentum* were cut off, and the wound dressed; she recovered without an untoward symptom. I presume in this case that the hernial sac had burst, but how or when, the history of the case gave no information, and that the protruded bowel and large portion of *omentum* had no proper sac, but had merely formed themselves a cavity in the cellular tissue.

Case 2.—A. B., aged fifty-five years, a healthy, stoutish woman, of loose texture, was admitted

Feb. 24th, 1842, having been the subject of femoral rupture on the right side for twenty years, the latter half only of which she has worn a truss. On the morning of the 21*st ult.* her bowels were last moved, and, having exerted herself more than usual during the day, the rupture increased beyond its ordinary size, and could not be returned as previously. She was constantly vomiting during the night; and next day was bled, put in the warm bath, and had the *taxis* applied for two and a half hours without relief. The vomiting ceased in the course of the day, and nothing was done for her yesterday except giving some sulphate of magnesia in the evening, which, not operating, castor-oil was given this morning, but without relief. She has now (noon) a little hiccough, and frequent fetid eructations, but has not vomited since the 22*d ult.* The belly is generally tender, and the pulse small; but the countenance is little distressed.

In front of POUPART's ligament there was a large swelling, extending to within two inches of the iliac spine, but not much elevated, and from its inner extremity a second swelling descended in the usual situation of femoral rupture, but pyriform rather than globular, and passing down lower in the thigh than usual. A distinct indentation existed between the two swellings, as if they were separated beneath the skin; and at this part was a scar, the result of an abscess five years ago. The fingers could be passed behind both swellings, especially the inner, which was tender; but neither were inflamed, nor appeared to have been much handled. The general resemblance to the former case was very strong. The *taxis* was employed

both before and after the warm bath, but without avail, and with her consent the operation was performed, at 2, P. M., upon the inner swelling. After cutting through, and turning off the skin and superficial *fascia*, an absorbent gland was found on POUPART's ligament, sending inwards a neck to join another below it; and three absorbent vessels were seen entering the former gland, having risen up from the femoral sheath, and by their tightness produced the depression between the two swellings already mentioned. The neck of gland was divided, and the *fascia propria*, which was very tough and almost fibrous, slit up on a director, exposing the hernial sac, which was so much larger than seemed at first, that I was obliged to widen the opening in the skin by cutting it inwards. The sac was then opened, and a small quantity of fluid escaped, followed by protrusion of *omentum*, and the cut, having been completed with a bistoury upon the finger, a knuckle of intestine, about three inches long, was found on the inner side of the swelling. I then passed my finger down to the stricture, and could enter just the tip within it; but the size of the other swelling rendered it so deep that I found it necessary to enlarge the external cut upwards previous to division of the stricture, which was made sufficient to admit the finger readily into the belly. The gut being congested, but bright, and, having examined the strictured part, and emptied it, I returned the bowel without difficulty into the belly. On carefully examining the hernial sac, in reference to the remaining swelling, I found an aperture in its outer wall close to POUPART's ligament, through which my finger readily passed into the tumour, the extent of which outwards was ascertained by the finger being buried up to the knuckle. The cavity contained nothing but soft *omentum*, which, having in vain attempted to withdraw, I thought best left alone. That *omentum*, however, in the opened sac, though healthy, being large in quantity, I cut off, having previously introduced a double ligature, and tied it on each side, which prevented any bleeding. She was then put to bed, and recovered without any hindrance.

Case 3.—A. W., aged fifty-five years, a spare, healthy woman, was admitted in the afternoon of

Nov. 4th, 1828, having ruptured herself on the right side ten years ago, since which time she has worn a truss constantly, which, however, has not fitted, and the rupture has been so much incarcerated five or six times as to need assistance for its reduction; but it does not appear certain, from her account, that its entire contents have been always returned. Yesterday evening (her bowels having been twice relieved during the day,) whilst engaged in her usual occupation, mangling, the rupture came down beneath the truss, which she took off, and, having returned the protruded parts, felt no farther inconvenience till 11 o'clock this morning, when it again came down, and, having attained larger size than usual, became painful, and made her sick and faint. She could not return the rupture, nor could her medical attendant, who twice employed the *taxis* during the afternoon, and then sent her on that evening to the hospital, where the warm-bath and *taxis* were resorted to, but without avail. When I saw her, at 6, P. M., she had been constantly retching for the last five hours, and so continued, raising, however, nothing more than a little transparent, colourless fluid. She had frequent eructations, increased by any pressure on the swelling; the belly is full, but not tender, and she complains only of pain at the lower part, near the rupture; pulse small; countenance pallid and anxious; the bowels have not been relieved since yesterday.

Upon POUPART's ligament was a large tumour of an oblong shape, extending from about three fingers' breadth to the inner side of the upper iliac spine, into the right *labium pudendi*. It was more prominent, bulky, and rounded, at its outer end, gradually narrowed as it proceeded inwards, and reaching the lower part of the *mons Veneris*, bent down at an angle, and descended for the distance of an inch into the *labium*. The upper outer part of the swelling was firm and unyielding, but the labial portion soft and fluctuating on pressure. The appearance of the tumour, which was such as might be supposed to depend on inguinal and femoral rupture existing simultaneously, rendered the *diagnosis* puzzling. But finding it possible to get my fingers under both ends of the swelling, although I could not pass them behind its centre, I concluded that the case was one of femoral rupture, accompanied with variety. This view was supported by the patient's statement, that till this morning, although often very large, the swelling had always been in the thigh alone, and not in the *labium*, where it first appeared only to-day. As the case was one of which I knew none like, I gladly availed myself of my friend the elder TRAVERS's

kind opinion, which, concurring with my own, it was determined to operate as for femoral rupture. At

9, P. M., a transverse cut was made from the middle of the firm swelling inwards, nearly to the spine of the *pubes*, and a second at right angles with and below it. The other coverings were then divided in the usual way, and on opening the hernial sac, a little dark-coloured *serum* escaped; and when it was fully divided, forthwith a quantity of *omentum* burst through the aperture, and the swelling in the *labium* at once subsided. This portion of *omentum* was very soft and loose in texture, and had been, doubtless, that last descended; but the remainder, forming the bulk of the swelling, was firm and matted together, and upon raising it a knuckle of intestine was seen, dark-coloured but bright and œdematous. Having introduced my finger into the sac, I could not at first pass it down to the stricture, as it was intercepted by a band, which I supposed to be an old adhesion; but having drawn the *omentum* and gut to the outer side, I was enabled to reach, and found the stricture very tight, and admitting only the tip of the finger, but sufficient to allow the entrance of the blunt-ended bistoury, with which I divided, till my finger would pass into the belly, up to the second joint. I then readily emptied the gut, and attempted to return it, but could not succeed. It was thought that the difficulty depended on the stricture not having been sufficiently freed, and I therefore prepared again to introduce the bistoury, by drawing the *omentum* and intestine to the outer side. This, however, being done, a broad membrane was seen descending from the upper part of the sac, behind which the finger could be passed. It was, this, doubtless, which first prevented the introduction of my finger into the stricture, and subsequently obstructed the entrance of the gut into the belly by dropping against the mouth of the sac. We determined on its division; and this done without further dilatation of the stricture, the intestine easily returned. The *omentum* was partially adherent to the mouth of the sac, and being in rather large quantity, and its matted part rather bruised, the greater portion of it was removed, and three little vessels in it disposed to bleed were singly tied. The sac having been thus emptied, was found to be of large size, extending rather more outwards than usual; and on its inner side, the finger being pressed, readily passed inwards, and for an inch and a half downwards into the right *labium*; but whether this part of the cavity had any peritoneal lining, I did not observe. She recovered without any drawback.

In January, 1842, she again came under my care with symptoms of strangulation. She had constantly worn the truss, but not to much purpose, as the rupture has come down four or five times a week. The original femoral swelling had now increased to the size of a large fist, and filled up a considerable part of the inguinal region both below and above POUPART'S ligament. On its inner side, the part which had descended into the *labium* was also enlarged, and its fore and upper part had assumed a remarkable form, exhibiting the appearance of the *appendix auriculæ* of the heart, with its loose extremity projecting upwards and forwards. This labial part of the swelling was very hard and firm, and its contents seemed solid, whilst the outer and larger portion was evidently filled with intestine, which could be readily felt, as the skin alone appeared to cover it, and pressure caused much gurgling.

The rupture was returned, after the warm bath, by emptying the smaller into the larger swelling, which having been done with some difficulty, the aperture between the two was grasped tightly, so as to prevent any escape, the larger swelling being thrust into the thigh by an assistant. I again employed the *taxis* upon it, and the rupture was slowly but completely returned into the belly. The mouth of the sac was large enough to admit the entrance of two or three fingers, and through the inside, the fingers could be readily passed into the appendicular swelling, and to the bottom of the *labium*.—J. F. S.]

1228. Wounding the epigastric or obturator artery, or one of their branches, in the operation for inguinal or femoral rupture, may cause a fatal or alarming bleeding, the more, as the blood is commonly poured into the cavity of the belly. By proper consideration of the points mentioned in the several kinds of these ruptures, this injury may indeed always be prevented. For stanching the bleeding, compression with oak agaric, plugs of lint moistened with styptics, with peculiar instru-

ments, (Desault, by means of broad compressing forceps, Schindler, with forceps having a hinge, Hesselbach, with a peculiar compressor, Hager, with a compressor for the middle meningeal artery,) the passing a needle around the bleeding vessel, the enlargement of the incision, and special tying the vessel, have been proposed. Hesselbach's instrument (*a*) seems to have the preference; with its spoon-shaped part we must endeavour to find the seat of the bleeding, as when it is passed into the belly, the blood in that cavity externally, which, however, is better done by introducing the forefinger. The spoon-like part is then to be placed on the wound of the vessel, the other broad part, on the front wall of the belly, and by means of a screw, the two parts are to be pressed together. A cold application assists the operation of this remedy.

[Although it cannot be doubted that wounds of either the epigastric or obturator arteries are very dangerous accidents, yet it is very remarkable that with the frequent variety of their origin and in the great number of operations for strangulated rupture, such cases are exceedingly rare, the number collected by Lawrence being not more than twelve or fourteen. In one of these, "the epigastric artery had been completely divided at three quarters of an inch from its origin, and it did not appear that the smallest quantity of blood had escaped from the divided vessel;" in another, in enlarging the stricture, "the wound immediately filled with arterial blood, which rose again almost directly to the edge of the incision when removed with the sponge. * * * The patient lost about a pint of blood, fainted, and the bleeding ceased, nor did it come on again." (p. 271). In other cases, however, the patient died of the bleeding, either with or without the mischief having been discovered.

If there be reasonable ground to suppose that either artery is wounded, the proper proceeding is to seek for and tie it, which was done by Mackay with success (*b*).

It is also remarkable that the bleeding does not always come on immediately at the operation; but from the two following cases it appears that this may arise from other arteries than either obturator or epigastric. Lawrence mentions a case of strangulated bubonocele in which "no blood was shed during the operation; hæmorrhage, however, took place on the same evening, but yielded to the application of cold cloths." There was no further bleeding till "the morning of the eighth day, when a profuse hæmorrhage took place from the wound; it consisted of arterial blood, and did not cease till two pints at least had been lost. He survived this occurrence about a week." The vessel which had been divided was "the arterial branch, which the epigastric sends to the spermatic cord; but its size did not seem adequate to the suply of so profuse a bleeding." (pp. 273, 74.) Everard Home (*c*) also relates a case of strangulated scrotal rupture, in which suppuration of the testicle having followed the operation, "a hæmorrhage took place in the evening (of the tenth day), which made the removal of the testicle necessary in order to secure the vessel. He lost a pound of blood; but ultimately recovered. (p. 109.)]

(*a*) Hesselbach, F. K., Beschreibung und Abbildung eines neuen Instrumentes zur sichern Entdeckung und Stillung einer bei dem Bruckschmitte entstandenen gefährlichen Blutung. Ein Anhang und Beitrag zu den neuesten anatomisch pathologischen Untersuchungen über die Leisten und Schenkelbrüche. Würzburg, 1816; with two copper plates.

(*b*) A. Cooper, p. 41.

(*c*) Cases and Observations on Strangulated Hernia, in Trans. of a Society for the improvement of Med. and Surg. Knowledge, vol. ii.

III.—OF UMBILICAL RUPTURE.

(*Hernia umbilicalis*, *Exomphalas*, Lat.; *Nabelbruch*, Germ.; *Hernie ombilicale*, *Omphalocèle*, Fr.)

Desault, Œuvres Chirurgicales, vol. ii. p. 315.

Cooper Astley, Anatomy and Surgical Treatment of Abdominal Hernia, part ii. p. 29.

Oken's Preisschrift über die Enstehung und Heilung der Nabelbrüche. Lanshut, 1810.

Soemmering, S. T., Ueber die Ursache, Erkenntniss und Behandlung der Nabelbrüche. Frankfurt, 1811,

Thurn, Ueber die Ursachen der Nabelbrüche, bei Kindern und deren Heilung besonders durch Abbinden; in von Siebold's Chiron., vol. ii. part ii. p. 3.

Müller, H., Inaug. Abhandl. über den Nabelbrüch, mit einem neuen Vorschlage zu seiner Behandlung. Enlangen, 1841.

1229. The *True Umbilical Rupture* passes through the opening of the navel, and is thereby distinguished from the so called *false umbilical rupture*, which is formed in the neighbourhood of the navel. Umbilical rupture is either *congenital*, or *arises accidentally* after birth.

1230. Congenital Umbilical Rupture is the consequence of an arrested development of the *fœtus*, of a backward formation of the abdominal muscles, the *fœtus* remaining in that earlier stage of development, in which the intestines have not yet entered into the cavity of the belly. This rupture is situated in the spongy cellular tissue which connects the vessels of the navel-string together. It is therefore on this account opaque, where covered by the integuments of the belly, but transparent over the rest of its extent where surrounded by the cellular tissue of the navel-string. Besides this cellular tissue, this rupture is also enveloped in a hernial sac, and lies in a triangular space, which is produced by the separation of the vessels of the navel-string from each other. The veins are always above, the two arteries below and on the sides. The size of this rupture varies according as it contains a larger or smaller quantity of intestines. Several portions of the small intestines are usually contained in the swelling; frequently also the *colon*, *omentum*, stomach, liver, and spleen.

[In tying the umbilical cord after birth, care should be taken to ascertain previously whether there be any protrusion of *viscera* into it, which sometimes having, from the small size of the rupture been overlooked, intestine has been included in the ligature, and wounded; instances of which are mentioned by Mauriceau (*a*), Sabatier (*b*), and others.—J. F. S.]

1231. Umbilical rupture after birth occurs, from the time of the separation of the navel-string to the third or fourth month. If circumstances, as violent screaming, restlessness of the child, and the like, then operate, which force the intestines violently against the walls of the belly, a portion of *peritoneum*, and of intestine, is easily thrust through the still open navel-ring, or the scar, not yet firm, gives way.

As the navel after the proper obliteration of the *annulus umbilicalis*, must be considered as the firmest part of the abdominal wall, it is probable that in the cases where true umbilical rupture has been observed

(*a*) Traité des Accouchemens, vol. i. p. 497.
(*b*) De la Médecine Opératoire, vol. i. p. 152.

in adults, it had already formed in childhood, but, on account of its small size, had been overlooked; or that the navel-ring is enlarged, as a consequence of great extension of the abdominal wall, in fat persons, or after frequent pregnancies. Umbilical rupture, in adults, is, therefore, more frequent in women, who have been often pregnant, after great extension of the belly from dropsy, and in very fat persons. Umbilical rupture occurring after pregnancy, has a round, sometimes cylindrical, sometimes conical form, and a circular base; in large swelling, the scar of the navel is more or less smoothed. The coverings of this rupture are:—1, the external skin; 2, the delicate *aponeurosis*, which spreads over the external surface of the abdominal muscles; 3, the *peritoneum* lengthened into the hernial sac. The latter is often very thin, and more often, adherent to the coverings and to the intestines, especially at the point of the swelling; it seems also deficient, and is sometimes torn. The neck of the sac is always very short, and connected internally with the aponeurotic navel-ring; in old and large umbilical ruptures it is tough, and often cartilaginous. In such ruptures, very considerable adhesions exist between the protruded intestines, themselves, and the hernial sac, so that they form an inseparable mass, and the contained intestines can only be returned with difficulty. Collections of stool may therefore occur in that part of the intestine between the rupture and the navel, vomiting, and the like. Actual strangulation is rare in umbilical ruptures; if, however, it occur, the symptoms are more severet han in other ruptures, and more rapid mortification is to be dreaded.

[Astley Cooper mentions "an example of the sac having been either absorbed or burst, by which openings have been formed, and portions of *omentum* protruded through the sac of the larger one.

Sometimes an umbilical rupture forms two tumours, of which Astley Cooper mentions an instance operated on by the elder Cline, who, "after returning the intestine from the hernial sac, on putting the finger into the *abdomen*, an opening could be felt about half an inch from that by which the finger passed, which led into another tumour by the side of the former." (p. 31). On *dissection*, in the tumour that was most inferior "I found," says Cooper, "a small portion of the *ileum*, and part of the *cæcum*. In the other tumour there was a portion of *colon*, and which adhered to the sac." (p. 47).

I have had a case (No. XI. in the Table) somewhat similar, in which the rupture, about the size of a half-quartern loaf, had somewhat the shape of the figure 8, the head of which was rather smaller, and bent over to the left side. In the course of the operation a deep tough band of cellular tissue was found thrusting down the middle of the hernial sac, which retained the indentation after the cellular band had been cut through. The sac contained a large quantity of hard impacted *omentum*, and some inches of intestine.—J. F. S.

Umbilical Ruptures sometimes acquire "enormous size in women, whose bellies are pendulous, from bearing a great number of children. In three such instances," says Cooper, "I have seen the *hernia* extending so low from the navel as entirely to cover the *pudendum;*" the largest he ever saw "measured across twenty inches by seventeen." (p. 34.)]

1232. In congenital umbilical rupture, it depends on its size and on the condition of the walls of the bellly, whether any thing can be undertaken for its cure. If that part of the intestine, external to the belly, be not large, and be reducible, its return must be carefully effected and reprotrusion prevented, by graduated compresses, which should be fastened with strips of sticking plaster and a body-belt. This practice is preferable to that followed by Hamilton, who after returning the intestine,

applied a stout bandage around the base of the swelling, and brought the edges of the abdominal coverings together, with two silver needles and sticking plaster, and the cure was effected in a few days (*a*). If the congenital rupture be considerable, and its return in a gentle manner not possible, the child usually dies soon after birth, in which case, the external covering of the swelling is thrown off and the intestines are laid bare. Experience, however, proves, that if the swelling be properly protected from all external pressure, granulations may be produced after separation of the external covering, and thus the whole part be gradually covered with firm skin and a tendinous expansion (*b*).

1233. The *treatment* of umbilical rupture occurring after birth, is easy. The parts are returned without difficulty, and are kept up with a convex pad of wood, wax, or the like, applied close to the navel-ring, and properly fastened with sticking-plaster, and a broad bandage. In changing the dressings, especial care must be taken that the protrusion of the intestine be prevented, by pressure of the finger on the navel-ring, till the pad be again properly applied. Usually, in children, a radical cure very soon takes place, on account of the natural tendency of the navel-ring to obliteration. In adults, elastic trusses, which yield to the motions of the abdominal muscles, are employed. Of the many, and some very complicated umbilical trusses, an elastic truss of a similar kind to that for inguinal rupture is preferable, of which the spring should be well fitted to the fulness of the belly, and its pad project directly from the spring; or a somewhat concave metallic plate, to which is attached a spring, with a pad, and kept in its proper place by an elastic bandage attached to both sides of the plate; or a plate of horn is applied, in the middle of which is screwed a pad, and fixed with a large, tight, sticking-plaster, and a belly-band, by which the rupture can be most certainly kept up. If the rupture cannot be returned, a large hollow pad must be used, by which the increase of the rupture is prevented.

Rothmund (*c*) after completely replacing the contents of the hernial sac, presses the external coverings and the hernial sac through the mouth of the sac into the belly, and thrusts a round plate, corresponding in size to the extent of the aperture, into the pouch thereby formed. On this plate, which can be kept steady by a stem projecting in its middle, a contrivance is to be attached, which can increase it from two to four lines at the greatest part of its periphery. By drawing the stem, the enlarged plate, which no longer can escape out of the mouth of the hernial sac, is firmly applied against the inner hinder wall of the latter. A somewhat larger plate, with an opening in its middle, corresponding to the inner plate, is applied on the coverings of the belly, and then the projecting stem of the first is to be passed through the opening of the second, and fastened by a contrivance attached to it. In this way the ensheathed hernial sac may be firmly compressed, at pleasure, at the whole hinder extent of the mouth, to the extent of some lines; and by this gradually increased pressure, after some days, adhesive inflammation is excited, by means of which the mouth of the hernial sac is closed, the compressed parts of the ensheathed sac at the hind surface of the navel-ring becoming adherent to it, and to the umbilical canal. This compressor cannot generally be borne more than three, and at most, five days. If the ensheathed hernial sac look livid, the compressor must at once be removed. The compressors are made of wood and metal (*d*)

["The presence of the intestine and *omentum* in the tumour keeping the navel open, oppose," says Desault, "its continual tendency to close; a tendency, how-

(*a*) Cooper, above cited, p. 32.
(*b*) Ribke, Heilung eines in der ersten Bildunund im Mangel der aüsseren Hant- decken begrüng deten Nabelbrückes; in Rust's Magazin, vol. viii. pt. i. p. 130.
(*c*) Müller, above cited, p. 53.
(*d*) Müller, pl. v.

ever, which sometimes becoming greater than the resistance of the escaped parts, compels their return into the belly, obliterates the aperture which has given them passage, closes, consolidates it, and hence spontaneous cures of infantile umbilical ruptures occur." (p. 317). He gives two instances of this fact. The one, a female child of two years of age, with a rupture the size of a large nut, which had occurred soon after birth, and for which nothing had been done. He proposed applying a ligature, but the parents would not permit it. In the following year he saw the child again, and the rupture had disappeared. Nothing had been done, but the tumour had gradually subsided. In the other case the rupture had existed from birth, and at five years of age it was determined on applying the ligature. It was however deferred, in consequence of an attack of small-pox. After the child's recovery the swelling was found much diminished, and DESAULT, presuming it might be cured by nature, left it alone. He was right; at the end of eight months it had entirely disappeared. SOEMMERING (*a*) and BRUNNINGHAUSEN (*b*) have mentioned several similar instances.]

1234. If the operation be necessary in strangulated umbilical rupture, the opening must be carefully made into the swelling, because the covering, are often very thin, and the hernial sac adherent to the skin, or intestines, or torn. The cut through the coverings should be made perpendicularly. If after opening the sac, and the proper disentanglement of the intestines, and so on, reduction cannot be effected, a director must be introduced between the neck of the sac, and the navel-ring cut into downwards with the button-ended bistoury. If previous to the operation, the impossibility of returning the rupture, on account of the existing adhesions, should be perceived, if the parts of the rupture be not gangrenous, a semilunar incision is to be made at the bottom of the swelling, on the right or left side, through the skin, the thin *aponeurosis* carefully divided, and a director attempted to be introduced at the upper or under part of the navel-ring, between it and the neck of the sac, and upon it the button-ended bistoury for cutting into the navel-ring; or if this be not possible the point of the left forefinger with the nail turned down, is to be placed between the neck of the hernial sac and the under edge of the navel-ring, and upon it a cut with a straight bistoury is to be carefully made from without inwards with a gentle motion of the hand. But if the parts in the rupture be gangrenous or self-strangulated, the sac may be carefully opened at any convenient place. The further treatment is to be guided according to the ordinary rules.

[ASTLEY COOPER mentions "one circumstance of danger which is peculiar to the umbilical *hernia*, which is, that when the skin has become very thin over the tumour, the pressure simply of the protruded parts, under strangulation, will sometimes very early destroy the life of that portion of the integument by stopping the circulation through it. It first turns green, the cuticle then separates from it, and that portion of the skin becomes dry and of a brown colour; and in the instances in which this circumstance came under my observation the patients have died." * * * "Suppuration," he also observes, "now and then takes place in the *omentum* of an irreducible umbilical *hernia*." (p. 35.)

As pregnancy is not an unfrequent cause of umbilical rupture, it is rather curious that strangulation at this period so rarely occurs. If it cannot be overcome by the usual remedies, the operation may be resorted to without the patient's condition rendering it less hopeful. ASTLEY COOPER mentions one case operated on successfully in the eighth month of pregnancy (*c*); LAWRENCE one in the seventh or eighth month (*d*); and CLEMENT another in the fourth month (*e*)].

(*a*) Above cited.
(*b*) LODER'S Journal für Chirurgie, vol. iii. p. 1.
(*c*) Above quoted, part ii. 347.
(*d*) Above quoted, p. 560.
(*e*) Observations on Surgery and Pathology p. 123.

1235. The radical cure of reducible umbilical rupture, in young persons, by the application of a ligature, after the reduction of the intestines, around the integument covering the rupture, by tying which tightly the parts taken hold of are destroyed, and a tough scar formed (1), is generally exceptionable; because, firstly, umbilical rupture is very commonly cured in children by the mere powers of nature; secondly, because the cure can certainly be effected by continued moderate compression; thirdly, because the operation is very painful, even dangerous, (as a small part of an intestine may be included in the ligature,) and after the scarring of the suppurating parts, compression is necessary for a much longer time; fourthly, because no decided radical cure can be effected, as a part of the neck of the hernial sac always still remains, and the scar produced is not sufficiently firm to prevent the dragging of the intestine. In female children, it must also be remembered that in pregnancy the scar may be torn (*a*). But in all the umbilical ruptures, which are several inches long, and purse-shaped, if the firm application of a truss be prevented by the great lengthening of the skin the ligature may be proper; and if it do not effect the closing of the navel-ring, the close application of a truss may be rendered possible (*b*).

(1) In former time this was recommended and practised by Paulus Ægineta, Albucasis, Pare, and others; objected to by Guy de Chauliac and Dionis, and again recommended, especially by Desault (*c*), von Graefe, and others.

[Scarpa, Astley Cooper, and others, are much opposed to the ligature. Benedict of Breslau has also abandoned it on account of the serious, if not dangerous, symptoms resulting from its use. He says (*d*):—"In all the cases, pain in the belly came on about the third day, with great tenderness to the touch, especially near the navel, and considerable fever, so that the presence of peritoneal inflammation could not be mistaken; in one instance there was also vomiting. All the patients recovered under antiphlogistic treatment; but the symptoms were so formidable for two days, that a surgeon would not be justified in employing this treatment unless all other measures had failed." And its my opinion he would not be justified even then; for it is asserted by Richerand (*e*) that many of Desault's cases, supposed to be cured, returned. A case is also mentioned (*f*) in which a child of seven and a-half years old died in consequence of such treatment, the operation being thus performed; "the patient was placed on her back, the contents of the *hernia* were returned, and the sac was raised and twisted to ensure the reduction. A flat buckskin ligature, three-fourths of an inch wide, was applied close to the *abdomen*, not so firmly as to strangulate the parts, but sufficiently to retain the *viscera* and excite adhesive inflammation in the sac. A strong silk ligature was then applied with sufficient firmness to interrupt all circulation. When the mortified part was cut away, it was found that a portion of *omentum* had adhered to the sac, and of course had been included in the ligature. The patient died on the tenth day. The ring was perfectly closed by adhesion and granulation, which sprung from its tendinous margin; the *colon* adhered to the inner surface of the granulations; no inflammation could be detected in any part," (p. 368). It must be admitted that in this case circumstances were not very favourable as to the success of the operation. "The mouth of the sac presented a diameter of three inches, and the enormous tumour extended to the knees. The swelling measured at the neck twelve inches in circumference; six inches lower it was fifteen inches; it was seventeen inches in length; and two extensive ulcers existed on its posterior surface" (*g*).—J. F. S.]

(*a*) Scarpa, above cited.—Girard, Mémoire sur la Hernie ombilicale chez des enfans; in Journal Général de Médecine, vol. xli. July, 1811.

(*b*) Guincourt; in Journal de Médecine par Corvisart, &c., vol. xxi. 1811.—Walther; in Salzburg Med.-chirurg. Zeitung, vol. i. p. 426. 1814.

(*c*) Above cited, p. 324.

(*d*) Rust's Magazin für die Gesammte Heilkunde, vol. xliv. p. 176.

(*e*) Nosographie Chirurgicale, vol. ii. p. 453.

(*f*) Fahnestock; in American Journal of the Medical Sciences, vol. xvii.

(*g*) For the above quotations I am indebted to Lawrence's work on Hernia.—J. F. S.

IV.—OF VENTRAL RUPTURE.

(*Hernia ventralis*, Lat.; *Bauchbruch*, Germ.; *Hernie ventrale*, Fr.)

Garengeot, Sur plusieurs Hernies singulières; in Mémoires de l'Académie de Chirurgie, vol. i. p. 699.

Pipelet, Nouvelles Observations sur les Hernies de la Vessie et de l'Estomac; in the same, vol. iv. p. 188.

La Chausse, B. J., Dissert. de hernia ventrali. Argent., 1746.

Klinkosch, Progr. quo divisionem herniarum novamque hernia ventralis speciem proponit. Prag., 1764.

Soemmering, S. T., Ueber die Brüche am Bauche und Becken, ausser der Nabel- und Leistengegend. Frankfort, 1811.

Cooper Astley, above cited, part ii. p. 49.

1236. A *Ventral Rupture* is that which protrudes through an unnatural opening on the front or side of the belly. This rupture is much more rare than either of those already mentioned. It takes place through openings in the abdominal muscles, and their *aponeuroses;* most commonly in the space between the two *m. recti*, more rarely on the sides of the belly, from the hip-bone to the last rib, and in the lumbar region (*Lumbar Rupture*) (1).

The *causes* of this rupture are the ordinary occasional causes of rupture, with existing relaxation of the abdominal walls, especially of the white line, after many pregnancies, in quick emaciation after previous stoutness; or it is caused by tearing of the muscles and *aponeurosis*, at the parts where scars have formed (2). Or the entire walls of the belly often spread into a sac which contains intestines (3). These ruptures are generally provided with a hernial sac, except when they are consequent on previous wounding of the *peritoneum*.

[(1) Of this very rare form of Ventral Rupture Cloquet gives an instance in a man of seventy-five years, who, whilst lifting a heavy mattress, felt a violent pain, with a sense of tearing in his loins, which gradually subsided in course of six weeks. But about a fortnight after, whilst getting up in his bed, he had a fresh attack of pain at the same spot. When seen next day he was much agitated, had violent colic, some *nausea* and vomiting, and his bowels were costive. The skin in the right lumbar region, without being discoloured, was raised slightly by a rounded swelling about five inches from the spines of the *vertebræ*. It was little tender, and when grasped, was found to be somewhat elastic, crackling, deeply situated, or at least separated from the skin by a layer of fat. It had a broad pedicle, increased in bulk, and dilated on coughing, sneezing, and making water. He had severe and constant pain deep in the right lumbar and iliac regions in the course of the *cæcum* and ascending *colon*. The swelling was much larger when he stood up than when lying down, and when he turned on his face it disappeared, and left a hollow readily distinguishable by the touch. He was treated by putting a pad upon the seat of swelling, after its contents had been returned, and confining it with a circular bandage. (pp. 5, 6, *note*.)

(2) I have seen two or three cases in which, after pregnancy, the *linea alba* has been torn to the extent of several inches; and in one of them below the navel I well recollect I could, without difficulty, bury my whole hand in the cavity of the belly, thrusting in the skin as a large pouch before it. In neither of these cases, however, was the protrusion of the bowels very considerable. There did not seem to be any thing remaining but the skin alone.—J. F. S.

Lawrence mentions a very interesting case of a woman who strained herself by lifting a heavy table, and died from inflammation of the chest. She had complained only of pain in the loins. But on examination both *m. recti abdominis* were torn through about one-third of their thickness, and there was a small quantity of coagulated blood

about the torn fibres; but the sheath was not ruptured. (p. 583). Probably, had she lived, this would have become a ventral rupture. In reference to wounds of the belly, which are sometimes followed by ruptures, he mentions, as an example, that this does not always occur. The case of a boy who had been largely gored by the tusk of a boar, and had the greater part of the stomach distended by a hearty dinner recently taken, the *omentum*, the transverse arch of the *colon*, and some small intestines protruded through the wound; they were returned with difficulty, and having been retained by the uninterrupted suture the case did well, and no rupture followed. (p. 584).

(3) Of the latter kind, in which a portion of the entire abdominal wall seems to yield, various instances are mentioned. Richter describes a broad swelling, as large as a woman's breast, in each groin of the same person (*a*). And Siebold describes one equal to a loaf of bread in size, between the cartilages of the ribs and navel (*b*).

1237. These ruptures may happen through the whole length of the white line (*Herniæ lineæ albæ*); but they are more commonly observed in that part above the navel, than in that below it. They for the most part contain a portion of *omentum*; if they be below the navel there usually lies in them a small piece of intestine, frequently the bladder or the womb. They often protrude so near the navel as to be easily mistaken for umbilical rupture. They have always an oval form, and have little prominence in comparison with their size; their neck is always oval, like the cleft through which they have passed; the neck of the sac is always very narrow in comparison to its size. If quite close to the navel-ring, they are distinguishable from true umbilical rupture by the oval shape of the neck of the sac, and by the navel being seen on one or other side of the swelling. Ruptures in the white line happen most frequently in women; their coverings are the same as those of umbilical rupture. They are kept up by the same trusses as the latter; but their radical cure is by far more rare than that of umbilical rupture. If there be strangulation, and the operation be necessary, it is the same as that for umbilical rupture; only the opening into the belly is best enlarged on one side or other.

1238. From these ruptures of the white line must be distinguished, those swellings formed by a portion of fat which has penetrated through a cleft in the white line, and have great resemblance to the omental ruptures of the white line. These swellings feel hard, are insensible, irreducible, and produce no inconvenience. If such swelling be accidentally accompanied with colic, a mistake is very easy. (Compare *par.* 1203.)

1239. At the upper part of the white line, and on the left side of the ensiform process, little ruptures not unfrequently arise, which, on account of the severe irritation of the stomach connected with them, may be called *Stomach Ruptures*, (*Herniæ ventriculi*, *Gastrocele*), but they usually contain a part of the transverse *colon* (*c*). They are often so small as to be scarcely perceptible, have usually the size of an olive, and are rarely larger. They produce, without being strangulated, pain, dragging at the stomach, great tenderness of the pit of the stomach, vomiting, hiccough, *nausea*, especially after eating; and these symptoms diminish

(*a*) Abhandlung von den Brüchen. Second Edit., translated into French by Rougemount, p. 7. Bonn, 1788. 4to.

(*b*) La Peyronie; in Mém. de l'Acad. de Chirurgie, vol. iv.—Littre; in Mém de l'Acad. des Sciences. 1714.

(*c*) In Loder's Journal, 1797, vol. i. p. 215.

in the supine posture. The swelling is only felt when the patient stands up, or when the body is bent forward. The cleft through which the rupture protrudes may be, perhaps, felt in coughing. For the purpose of keeping up this rupture, it is best to wear stays made of whalebone, which, at the part corresponding to the rupture, are furnished with a pad of sufficiently large size.

1240. The *treatment* of the other Ventral Ruptures agrees, except in some slight modifications, with that for ruptures of the white line. If strangulation render the operation necessary, the dilatation of the stricturing part must be made in such direction that no important vessel shall be injured, and as much as possible directly upwards.

V.—OF ISCHIATIC RUPTURE.

(*Hernia ischiatica, dorsalis, iliaca posterior*, Lat.; *Hüftbeinbruch*, Germ.; *Hernie ischiatique Ischiocèle*, Fr.)

1241. *Ischiatic, Dorsal Rupture*, passes through the notch of the haunch-bone, above the sacro-ischiatic ligaments and pyriform muscle, below the gluteal muscle, and appears externally near the lower part of one of the lateral edges of the rump-bone, or *coccyx;* it attains often a considerable size, extending more either upwards and backwards, or outwards, towards the *perinæum*. It contains, either merely intestines, urinary bladder, or both small and large intestines, the womb, and the like, together. It is undecided whether the male or female sex be more subject to this rupture. It is more frequently noticed on the right than on the left side. It may be congenital, or may occur subsequently.

The various cases of this rupture described are those of—

Papen, C. H., Epistola ad. illustr. virum Alb. de Haller de stupendâ herniâ dorsali. Götting., 1750; in Haller's Disput. Chirurg., vol. iii. p. 314.

Verdier; in Mémoires de l'Académ. de Chirurgie, vol. ii. p. 2, note *a*.

Camper, Demonstrationes anatomico-pathologicæ, lib. ii. p. 17.

Rose, Progr. de Enterocele ischiatica. Lips., 1792.

Lassus, Pathologie Chirurgicale, vol. ii. p. 103.

Cooper, Astley, above cited, p. 66.

Schreger, Chirurgische Versuche, vol. ii. p. 156.

Berzold; in Siebold's Samml. chirurg. Beobact., vol. iii. p. 292, pl. iii.

Monro, Anatomy of the Gullet, Stomach, and Intestines, Edinb., 1811, p. 380.

Hager, above cited, p. 275.

Roubein, Annales cliniques de Montpellier, vol. viii. p. 354.

1242. The *diagnosis* of this rupture is very difficult. Whilst it is small and covered by the great gluteal muscles, it cannot be discovered. In making the *diagnosis*, we must first remember the seat of the swelling; the suspicion of a rupture is so much the greater when it is congenital, and has a form, namely, a globular form, which other swellings generally have not. It can only be determined when the intestine can be felt in the rupture, which may be returned, and again protrude. In small ruptures the convolutions cannot be at all felt; and even without adhesions, the return of this rupture may be impossible, on account of the small size of the aperture by which it has escaped. In large ruptures, an emptiness of the belly is noticed.

Congenital ischiatic rupture first begins with a broad base from the

body, but in larger ones the neck is narrower than the bottom. As the urinary bladder can alone lie in dorsal rupture, so must the symptoms of vesical rupture be remembered in the *diagnosis*. The distinction of this rupture from a fatty or encysted swelling is difficult; it may be easily mistaken for an abscess when it proceeds to suppuration. *Spina bifida* is distinguished from this rupture by its seat in the middle of the rump-bone, by its fluctuation, and, in most cases, by its transparency.

1243. As in this rupture the pelvic *aponeurosis* is ordinarily torn and not displaced with it, it is covered only by skin, and by the outspread, or divided fibres of the *m. levator ani*. The sac of the rupture lies between the under inner edge of the great gluteal muscle and the side of the *rectum*. On the inner side of the hip-bone, the neck of the sac is immediately surrounded by the obturator artery, both above and below. Upon the outer side of the hip-bone, the ischiatic nerve lies before and below, and the gluteal artery behind (A. Cooper) (*a*).

1244. Small dorsal ruptures may be easily reduced; they return of themselves into their proper place. Large and more long-continued ruptures are capable of a slow reduction by a continued suitable position and external pressure. Reduction may be impossible on account of adhesion, or if the greater number of the abdominal organs be contained in the rupture, on account of the contraction of the walls of the belly. According to Astley Cooper, if ischiatic rupture render the operation necessary, and the extension of the mouth of the sac cannot be effected with a blunt hook, it must be divided forwards. Seiler considers it absolutely necessary in dividing the mouth of the sac, to cut layerwise from without inwards, and to tie the divided arteries immediately.

Hager (*b*) distinguishes an *upper* and *lower* ischiatic *rupture;* the one should descend above the *m. pyriformis*, the other between it and the ischiatic nerve and the upper of the *m. gemini;* the one has at its escape from the ischiatic hole, the upper gluteal artery above and behind, and the nerve below it; the other has the lower gluteal artery, the pudic artery and vein, and the nerves below it. It is best not to open the hernial sac, and in the superior ischiatic rupture, to divide its mouth forwards and outwards, but in the inferior, forwards and upwards.

Scarpa (*c*) considers this in women as enlarged pudic rupture, and in men as large perineal rupture, and therefore treats them as such. This opinion is perhaps right as regards some of the above-described cases, for instance, those of Papen and Bose; but it is contradicted by other cases in which there has been sufficient anatomical examination.

VI.—OF THYROID RUPTURE.

(*Hernia Foraminis ovalis seu thyroidei*, Lat.; *Bruch des eirunden Loches*, Germ; *Hernie du Trou ovalaire*, Fr.)

Garengeot, above cited, vol. i. p. 709.

Heuermann, Abhandlung der vornehmsten Chirurg. Operationen. Copenhagen, 1778, vol. i. p. 578.

Eschenbach, C., Observata quædam anat.-chirurg. medica rariora. Rostoch., p. 265.

Günz, De herniis, p. 96.

Vogel, B., Abhandlung aller Arten der Brüche. Glogau, 1769. 8vo. p. 204.

(*a*) Above cited, pl. xxiii.

(*b*) Above cited, p. 272.

(*c*) Supplement, above cited, p. 150.

Camper, Demonstrationes anat. pathol., vol. ii. p. 17.
Cloquet; in Journal de Médecine par Corvisart, etc., vol. xxv. Bulletin de la Faculté de médecine, No. 8, 1812. p. 194.
Buhle, De herniâ obturatorâ. Hal., 1819.
Gaderman, Ueber den Brüch durch das Hüftbeinloch, nebst einem seltenen Falle hierüber. Lanshut, 1833. 8vo.
Cooper, Astley, above cited, part ii. p. 61.
Cloquet, J., Pathologie chirurgicale. Paris, 1831. pl. v.

1245. In *Rupture of the Thyroid Hole*, the intestines pass through the opening in the ligament by which the obturator nerve and vessels, pass. The share-bone is in front of the neck of the sac, and its under, inner, and outer part, is surrounded by the obturator ligament. The base of the rupture is between the *m. pectineus* and *adductor brevis*, or between the front heads of the *adductor*. The obturator vessels are upon its inner hinder part, and large branches of the obturator nerve are before it. Differences however may occur, especially if the obturator and epigastric arteries arise in common, of which a case was seen by Gadermann where the artery passed first on the inner, and then on the front of the hernial sac. This rupture is at first very apparent, if a large quantity of intestine be protruded. It may have a different form, because it penetrates through different interspaces of the muscles. It occurs more commonly in females than in males, and may contain intestines, *omentum*, and even the urinary bladder; and not rarely does it occur at the same time on both sides.

[Cloquet says (*a*), that "Ruptures of the subpubic (thyroid) hole are much more frequent than generally supposed, and that they are more commonly met with in women than in men. They have distinctive characters when they have attained a certain bulk; are capable of being operated on, especially in thin persons; and that the bladder may displace itself, through the subpubic hole" (p. 87.) In a case, however, which he has given an account of (*b*), the tumour produced no visible external swelling, although of the size of a small hen's egg; but it was covered by the *m. pectineus* and *adductor longus*. And in Duverneys case (*c*), in which there was rupture through both thyroid holes, although each of the swellings was as large as an egg, yet no external tumour was observed. Neither was there any swelling in Smith's, of Manchester, case (*d*). It must, therefore, be taken as a rule, that these ruptures are not usually discoverable, although in Garengeot's patient it was; the tumour, which was distant about a finger's breadth from the *pudendum*, descending six inches down on the inner and upper part of the thigh (*e*); it was reduced. Lawrence considers that "the *m. pectineus*, the long and middle heads of the *m. triceps*, and the *m. gracilis*, so completely close the space into which the sac protrudes, that they must by their pressure prevent it from increasing to any great bulk." (p. 619.)

Frantz relates (*f*) the case of a woman forty years old, who, with many symptoms of strangulated rupture, had severe pain at the upper inner part of the left thigh, which came on suddenly, and recurred every ten minutes. No swelling was observable, but pressure high up between the *m. triceps* and the adductor muscles produced severe pain. There was neither tenderness nor pain in the belly. Three years previously she had had the same symptoms, but was suddenly relieved, whilst pressing on the part, when something seemed to go back with a noise into the belly. This had occurred more than once since, though less severely. When Frantz attended her, the symptoms were much more violent and less manageable; bleeding, purging, pressure, and other means were useless. Stercoraceous vomiting occurred on the ninth day, and the symptoms of strangulation increased up to the fourteenth,

(*a*) Recherches Anatomiques.
(*b*) Journal de Corvisart, above quoted.
(*c*) Mém. de l'Acad. Roy. de Chirurgie, vol. i. p. 711.
(*d*) Lancet, 1829–30, vol. ii. p. 735.
(*e*) Mém. de l'Acad., just cited, p. 708.
(*f*) Allgemeine Medicinische, Central Zeitung, April, 1842.

when she seemed dying, but a free discharge of stool then took place; and ultimately she recovered.

The only two examples of this disease I know of, are one from a male subject in St. Thomas's Museum, and another in the collection of the Royal College of Surgeons.—J. F. S.]

1246. The *diagnosis* is founded on the seat of swelling at the upper inner part of the thigh, on its peculiarly elastic tension, on the mode of its origin, on the possibility of its reduction, on the sensation of gurgling, or of different kinds of contents in the swelling, and on the gastric symptoms which usually accompany ruptures. This rupture may be strangulated, and the strangulation is usually at the mouth of the sac, but is more rarely caused by the neck of the sac or by the muscles.

1247. If the rupture be reducible, it must be returned to its proper place, and there retained by means of a graduated compress and an inguinal spica bandage, or with an inguinal truss, of which the neck is more lengthened downwards, and the pad comes directly below the transverse branch of the share-bone, at the origin of the *m. pectineus*. If there be strangulation, if the remedies employed be ineffectual, and the operation be indicated, the enlargement of the stricture, when possible, must be effected in the bloodless way, with the blunt hook from within outwards, and downwards. The dilatation with the knife, if necessary, must, according to Astley Cooper, be made inwards.

If the rupture be concealed beneath the muscles, the *diagnosis* is rarely so certain that the operation can be undertaken. According to Gadermann (*a*), the cut must be made through the skin and femoral ligament, an inch below Poupart's ligament, and as far from the pubic *symphysis*, and continued rather inwards, about four inches in length; the pubic muscles must be cut through obliquely, and also the long and short heads of the *m. triceps*.

VII.—OF VAGINAL RUPTURE.

(*Hernia vaginalis*, Lat.; *Scheidenbruch*, Germ.; *Hernie vaginale*, Fr.)

Garengeot, above cited, p. 707.
Hoin, above cited, p. 211.
Christian, On a species of Vaginal Hernia occurring in Labour; in the Edinburgh Medical and Surgical Journal, vol. ix. p. 281.
Stark, Dissert. de herniâ vaginali et strictura uteri. Jena, 1796.
Cooper Astley, above cited, part ii. p. 56.

1248. In *Vaginal Rupture* the intestines pass down in the fold of the *peritoneum* between the womb and the *rectum*, or between the former and the bladder, in consequence of which a swelling takes place on the hinder or front wall of the *vagina*, but for the most part more on one than on the other side, which, as it enlarges, passes between the *labia*, and attains considerable size. The rupture usually contains the urinary bladder when it is on the front wall of the *vagina*, or the womb, when it is on its back wall. There may be also a portion of the small intestine, more rarely of the *colon* or of the *omentum*. The swelling is elastic, and free from pain; when pressed it recedes, but recurs on coughing, and so on; it increases in the upright, and diminishes in the supine posture. The mouth of the womb is completely free. If the swelling occur at

(*a*) Above cited, p. 29.

the hind wall of the *vagina*, it is generally deeper than in front; in the latter case it is also usually accompanied with great inconvenience, in consequence of displacement of the bladder. With a large rupture at the hinder wall of the *vagina* there is most commonly prolapse of the *anus*. If the rupture be caused hastily, by violent straining and the like, the patient feels as if something were torn in the *vagina*, and severe pain, which subsequently is converted into a remitting colicky pain. If the vaginal rupture contain the bladder, it causes great disposition to make water, itching in the *urethra*, retention of urine, tension and painful distension of the belly, sometimes agitation, restlessness, dragging at the stomach, and sundry disturbances of the nervous system. In the protruded part of the bladder a stone may be formed.

1249. The predisposing causes of vaginal rupture are, relaxation of the *vagina* from previous delivery; whites, improper use of *coitus*, warm bathing, fire-pans, relaxed state of the body, inclination of the *pelvis* backwards, so that the intestines sink more deeply into it, and also wide *pelvis*. This rupture generally occurs soon after delivery, from straining; it rarely happens in unmarried women.

1250. The replacement of vaginal rupture is usually easy. The patient being placed on her back, pressure is made with the fingers upon the swelling, and continued, if it return upwards with the fingers, even to the entrance of the womb. If the reduction be difficult it should be favoured by relaxing clysters, and by continuing the supine posture. The reprotrusion of the rupture is best prevented by a cylindrical pessary, which can be fixed with a **T**-bandage. The patient must avoid all straining, and if the rupture protrude in spite of the pessary, that instrument must be removed, and after the reduction of the rupture replaced. A radical cure may perhaps in many cases be effected by the continued use of the pessary and of astringent injections into the *vagina*. If this rupture protrude during childbirth, it must be kept back by continued pressure, till the child's head have descended, and then delivery is quickly completed. Vaginal rupture may be strangulated (although rarely, on account of the yieldingness of the parts surrounding the rupture) by the enlarged womb during pregnancy, or by the collection of fæcal matter. The return is effected by the use of suitable means, at least no case is known in which the operation was necessary, which also is only possible when the rupture is low down in the *vagina*.

The midwife Rondel (*a*) recommends a ring-pessary of watch-spring and Indian rubber for keeping up this rupture.

VIII.—OF PERINÆAL RUPTURE.

(*Hernia Perinæi*, Lat.; *Mittefleischbruch*, Germ.; *Hernie du Périnée*, Fr.)

1251. *Perinæal Rupture* occurs by the descent of the intestines between the *rectum* and *vagina* in women, and between the *rectum* and bladder in men. The external swelling in the *perinæum* is different;

(*a*) Mémoire sur la Cystocèle vaginale, et sur les meilleurs moyens d'y remédier. Paris, 1835.

it presents itself in the male generally in the region of the neck of the bladder; in women between the *vagina* and *anus*, usually on one or other side, and at the bottom of the *labium*. This rupture may contain a part of the intestinal canal, of the *omentum* or of the bladder. In women it must always be complicated with vaginal rupture (1). In men it causes various urinary inconveniences.

(1) Chopart and Desault (*a*) believe that perinæal rupture in women is not possible as a vaginal rupture is more easily formed. Its existence in women has, however, been proved by the observations of Mery (*b*), Curade (*c*), Smellie (*d*), and Schreger (*e*); and many examples of it have been given by Chardenon (*f*), Pipelet (*g*), Bromfield (*h*), Schneider, Scarpa (*i*), Jacobson (*k*), and Schott (*l*); also A. Cooper (*m*).

1252. Perinæal rupture is rare, and only possible in violent driving of the intestines downwards; in great resistance of the coverings of the belly, great relaxation of the peritoneal fold between the *vagina* and *rectum*, or between the *rectum* and bladder, and in slight inclination of the *pelvis*. Perinæal rupture which contains the bladder, occur especially in pregnancy, when the bladder is thrust downwards and outwards by the distended womb (*n*). In men, perinæal rupture has a round or pear-shaped form; the swelling is in the *perinæum*, on one side of the *anus*, so that the *raphe* is pressed somewhat aside. In women, so long as the rupture remains in the *perinæum*, the swelling is roundish, and bluntly conical-pointed; as it extends into the *labium* it becomes oblong, egg-shaped. Generally perinæal rupture is small, or up to the size of a hen's egg; but it may attain considerable bulk.

1253. The return of this rupture is usually easy, and it may be kept back by a bandage, consisting of a spring surrounding the *pelvis*, from the hinder part of which a curved spring descends, and attached to its extremity a conical pad, which being applied directly upon the seat of the rupture, the latter is kept up by the strength of the spring and by an elastic bandage around the thigh. If this rupture be strangulated, and its reduction by suitable remedies impossible, the operation is neither difficult nor dangerous, as the opening of the hernial sac is almost always external to the bottom of the *pelvis*. After opening the sac, a button-ended bistoury is to be introduced between the intestine and the tough edge of the hernial sac, and the strangulation may be relieved by a slight cut from below upwards, obliquely towards the side (Scarpa).

The opinion, that by pressing back the external swelling, the rupture cannot be completely reduced, is disproved by Scarpa's observations.

The Pudendal Hernia of Astley Cooper (*o*), the posterior labial rupture of Sei-

(*a*) Traité des Maladies Chirurgicales, p. 292.
(*b*) Mémoires de l'Acad. de Chirurgie, vol. ii. p. 25.
(*c*) Mémoires de l'Acad. des Sciences, 1713.
(*d*) Sammlung besonderer Fälle in der Hebammenkunst, vol. ii. pp. 147, 148.
(*e*) Ib., p. 181.
(*f*) Hoin, above cited, p. 135.
(*g*) Mémoires de l'Acad. de Chirurgie, vol. iv. p. 182.
(*h*) Chirurgical Observations, p. 264.
(*i*) Olliver's Translation, Mémoire sur la Hernie du Périnée; at the end of his Supplement, p. 118.
(*k*) In von Graefe und Walther's Journal, vol. ix. pt. iii.
(*l*) Nosologisch therapeut. Betrachtung drerier interessanter Krankheitsfälle, above cited, p. 59. Frankfurt, 1827. 8vo.
(*m*) Above cited, p. 59.
(*n*) Kosch, Dissert. de Cystocele perinæali Regionmont, 1826.
(*o*) Above cited, p. 52.

LER, is to be considered merely as a variety of the perinæal rupture in women. The intestines descend along the *vagina*, between it and the *m. levator ani*, and form a swelling on the under half of the *labium*. It is distinguished from inguinal rupture, by the upper part of the *labium* and the abdominal ring being quite free. It is felt on introducing the finger into the *vagina*, pressing on the side of that passage, high up.

See SCARPA, above cited, p. 139.

CLOQUET, J.; in Nouv. Journ. de Médecine, vol. i. p. 427.

BOMPARD; in Dictionnaire des Sciences Médicales de Bruxelles, vol. vii. p. 448.

IX.—OF RECTAL RUPTURE.

(*Hernia Intestini recti*, Lat.; *Mastdarmbruch*, Germ.; *Hedrocèle*, *Archocèle*, *Hernie du Rectum*, Fr.)

SCHREGER, above cited, p. 136.

1254. In *Rectal Rupture* there is a prolapse of the *rectum*, which contains the portion of protruded intestine. The predisposition to this rupture seems to be slight inclination of the *pelvis*, slight projection of the promontory, and slight curving of the rump-bone.

1255. A rectal rupture may perhaps be inferred, firstly, from the long continuance of the prolapse and its size; secondly, especially if the position of the body show slight inclination of the *pelvis;* thirdly, if the flatness of the upper part of the belly indicate an unnatural deepness of the small intestines; and fourthly, if the swelling of the prolapse be upon the one side of greater size, and at the same time, firmer, more elastic and fuller, than on the other. The *diagnosis* is determinable only by examination; the attempt to return the prolapse gives opportunity for seeing whether there be any motion of the contents, whether, in coughing and so on, the swelling reprotrude; whether the patient experience any colic in the prolapse. These experiments may be without satisfactory result, if there be adhesions in the rupture. An old prolapse of the *rectum*, in which there is thickening, enlargement, and so on, has great resemblance to such adherent rupture. Rectal rupture may inflame; there may be even strangulation, by the contraction of the sphincter muscle.

1256. The *treatment* consists in the return of the rupture, and when this is done, in preventing its reprolapse, as will be mentioned in speaking of the rectal prolapse. If the replacement be impossible, the case must be treated as a prolapse of the *rectum*.

X.—OF PHRENIC RUPTURE.

(*Hernia phrenicâ*, Lat.; *Zwerchfellbruch*, Germ.; *Hernie diaphragmatique*, Fr.)

[Protrusion through the *diaphragm* occur in different ways.

First, Through the natural apertures by which the *aorta*, *vena cava inferior*, *œsophagus* and intercostal nerves pass. These are very rare, and ASTLEY COOPER says he has never seen an instance. MORGAGNI mentions one, in which the *omentum*, the *duodenum*, and *jejunum*, with part of the *ileum*, ascended by the side of the *œsophagus*, and compressed the heart and lungs into a very small compass (*a*); also another,

(*a*) Epist. liv. art. xiii.

in which part of the *colon*, a large portion of the *omentum* and the *pancreas* passed through the hole for the intercostal nerve. Fantoni also mentions a case, in which the stomach and part of the *omentum* had entered the chest by the side of the *œsophagus* (*a*).

Second, From malformation of the *diaphragm*, which is more frequent, and is more common on the left than on the right side, and in the muscular than in the tendinous portion of the muscle (1). Macaulay mentions one case, in which the stomach and greatest part of the *pancreas* had passed into the cavity of the left *pleura;* and another, in which the whole liver had entered the right *pleura* (*b*). If the protrusion and the aperture be considerable, the child dies soon after birth. But if the aperture be small, the patient may live for some years; and in the case mentioned by Astley Cooper (*c*), the following symptoms were observed. Oppression in breathing from childhood; and as she increased in years the least hurry in exercise, or exertion of strength, produced pain in the left side, a frequent cough, and very laborious respiration. After great exertion an attack of pain in the upper part of the *abdomen*, with vomiting, and a sensation of something dragging to the right side, and always referred to the stomach. The cessation of these symptoms was as sudden as their accession; after suffering severely for a short time all pain and sickness ceased. These symptoms were of longer continuance as she became older. At twenty-eight years she died, having had symptoms of strangulated rupture for some days before. *On examination*, eleven inches of the great arch of the *colon* was found to have passed through a hole, two inches in diameter, in the left side of the *diaphragm* into the chest, together with a considerable portion of *omentum* (2). These cases generally are unprovided with any hernial sac, the *peritoneum* and *pleura* both seeming to terminate at the margin of the hole. Cooper, however, relates a case, in which there was a sac considerably larger than a tennis-ball in the right side of the chest, consisting of the *pleura* and *peritoneum* united, with its orifice at a small distance from the right side of the ensiform cartilage, where there appeared a deficiency of fibres in the large muscle of the *diaphragm*. The sac contained the right extremity of the stomach and beginning of the *duodenum*, the arch of the *colon*, and part of the *omentum* (3).

Third, From wounds or laceration of the muscle, which remain during life. This may happen from penetrating wounds with the sword, or by broken ribs being thrust through the *diaphragm*. Sometimes even a blow on the belly, received in a fall, will rupture the tendon of the *diaphragm*. The patient lived five days, and on *examination* the stomach and part of the *duodenum* were found protruded into the left *pleura* (4). (A. Cooper.)

(1) In St. Thomas's Museum there are two specimens of Phrenic Rupture through the left side of the muscular part of the *diaphragm;* in the one small intestines, and in the other part of the stomach has passed into the chest.

(2) This preparation is in the Museum at St. Thomas's. Two other cases are mentioned; one by Clark (*d*), and the other by the younger Monro (*e*).

(*a*) De Observ. Med. et Anat. Epist. 1714. Epist. xxiii.

(*b*) Medical Observations and Enquiries, vol. i. p. 25.

(*c*) Medical Records and Researches.

(*d*) Transactions of a Society for the improvement of Medical and Surgical Knowledge, vol. ii. p. 118.

(*e*) Treatise on Crural Hernia.

(3) An instance of protrusion of half the pyloric extremity of the stomach, the whole arch of the *colon* and the *omentum*, through a hole, two inches in diameter, in the left muscular portion of the *diaphragm*, near the *vertebræ*, is mentioned by Leacock (*a*), in a man of forty-nine, who had severe pain of the belly, especially at the pit of the stomach; constant vomiting, with rigors and disposition to syncope on the slightest movement. He died within thirty hours of the symptoms coming on.

(4) A case of aperture through the tendon of the *diaphragm*, by which the stomach, transverse arch of the *colon*, and *omentum* passed into the left side of the chest, is related by Macfayden (*b*).

XI.—OF MESENTERIC AND MESOCOLIC RUPTURES.

(*Hernia mesenterica et mesocolica*, Lat.)

It might at first sight appear incorrect to describe these as ruptures, because they do not leave the cavity of the belly; but they are as truly ruptures as if they did, inasmuch as they escape from their proper cavity, the reflected *peritoneum*, and are found on its external surface.

The mesentery and mescolon, each consisting of two layers of *peritoneum*, may have either of these layers naturally deficient, or torn by violence, and thus an opening may be formed, through which the intestines entering, separate the peritoneal layers and form a hernial pouch between them. Astley Cooper says (*c*) that he is unable to determine which of these is the cause of the disease, but is disposed to believe its source is in an originally defective structure. Whether these cases ever present symptoms of strangulation may be questionable. Of the two cases mentioned by A. Cooper, nothing was known, and his presumption of what the symptoms might have been is of little consequence. In the mesenteric rupture, all the small intestines, except the *duodenum*, had passed between the mesentery by a small aperture in its hinder layer. In the mesocolic rupture, the aperture was in the front layer of the mesocolon on the right side, and it contained all the small intestines, except the *duodenum*, a small part of the *jejunum*, and the termination of the *ileum*. Lawrence says (*d*) he has seen an instance of mesocolic rupture in that portion of the mesocolon belonging to the sigmoid flexure of the *colon;* and also refers to Jobert's case (*e*), in which the intestine having passed through Winslow's hole had become strangulated in an opening of the mescolon.

It may also be here noticed that Lawrence has seen the broad ligament of the wound separated and forming a sac similar to those just mentioned, (p. 630).

As the disease is necessarily fatal, it has been proposed to open the belly near the presumed seat of the obstruction, and if possible ascertain it. This was done, though without success, by Dupuytren; but his failure is attributed to his own wishes in the conduct of the operation having been overruled. The examination after death proved however that his proposal was the correct one. (*f*).

(*a*) A. Cooper, above cited, p. 72.
(*b*) Edinb. Med. and Surg. Journ. vol. xix. p. 382.
(*c*) Above cited, part ii. p. 73.
(*d*) Above cited, p. 630.
(*e*) Traité des Maladies Chirurgicales, vol. i. p. 522.
(*f*) Jobert. p. 581.

XII.—STRANGULATION OF INTESTINE WITHIN THE PERITONEAL CAVITY.

The bowels may become strangulated within the peritoneal cavity, according to Astley Cooper (*a*), by passing through apertures in both layers of the *omentum*, mesentery or mesocolon; by adhesions consequent on inflammation leaving an aperture in which a portion of intestine becomes confined; and by a membranous band forming at the mouth of the hernial sac, lengthening by the repeated protrusion and return of the intestine, and at last accidentally entangling and confining it. To these may also be added the adhesion of the *omentum* to the bottom of the hernial sac, which sometimes becoming tense, presses the bowel passing behind between itself and the hind wall of the belly, and preventing the passage of its contents, produces strangulation. Of the two latter forms notice has already been taken (*par.* 1171 and 1177, *note* 1) as being connected with the ordinary descent of ruptures.

Lawrence observes (*b*), "the violence of the symptoms and their rate of progress vary very much in different instances. They sometimes come on gradually, and advance very slowly, the case appearing to be one of mechanical obstruction, and being attended with an almost indolent enlargement of the *abdomen*. In other instances the close pressure of the stricture excites active *peritonitis* and *enteritis;* the inflammatory symptoms are strongly marked, and the case proceeds rapidly to a fatal termination. As the exciting cause of the mischief is not indicated in these cases by any characteristic symptoms, they are considered and treated as examples of ordinary *peritonitis* and *enteritis*. The real nature of the malady is not suspected until it has lasted for some time and more especially from the combination of obstinate constipation with fæcal vomiting. * * * The disease if left to itself is inevitably fatal," (p. 630).

The subject of Internal Strangulation has occupied the attention of Rokitansky of Vienna, and he has divided it (*c*) into three species. *First.* The narrowing or complete obliteration of the canal of a piece of intestine, resulting from the pressure exerted on it at one or more spots, by a smaller or larger portion of intestine or its mesentery, so as to compress it against the opposite side of the *abdomen*. *Second.* The rotatory species, which consists of the rotation of one part round an axis formed by some other part; it includes three subspecies; *a*, the rotation of a portion of intestine round its own axis; *b*, round an axis formed of the mesentery; *c*, where a portion of intestine forms the axis round which another larger portion with its mesentery turns, so as to touch the periphery of the axis at every point. *Third.* This is caused by some peculiar arrangement of parts, the result of original malformation, or of previous disease. These strangulations of the intestine occur in circular or fissured spaces formed, *a*, by fibres or bands of cellular membrane running from one organ to another; *b*, by adhesion of the free end of the vermiform appendix to some spot of the walls of the *abdomen*, or to a portion of intestine or mesentery; *c*, by adherent *diverticula; d*, by the adhesion of two convolutions at a single point; *e*, by perforations in the mesentery, or by fissures in an *omentum* altered by disease.

The conclusions which Rokitansky draws from the numerous cases with which his paper is illustrated are, *First.* That though no age precludes the possible occurrence of internal strangulations of the intestines, yet they are most frequent in the

(*a*) Above cited, p. 75.
(*b*) Above cited.
(*c*) Medicinische Jahrbücher des Oesterv. St, vol. xix. 1836.—Also in British and Foreign Medical Review, vol. iii. p. 495. 1837.

middle and advanced periods of life. *Second.* That for a longer or shorter period before the fatal termination, the patient is attacked by symptoms indicating a strangulation of the intestine. These generally commencing with a sudden cutting pain in the bowels (in some cases proceeding from a determinate point) followed by more or less rapid visible distention of the belly, tympany, constriction of the chest, anxiety, *nausea*, and vomiting, according to the violence and duration of the strangulation, sluggish bowels and long continued costiveness occur, with or without the previous symptoms. Rest, gentle aperients, and favourable positions of the body, mitigate or dissipate these symptoms, but they recur from the original cause, and terminate fatally. *Third.* The course of the affection is not generally very rapid; it seldom destroys the patient before the second day, and frequently runs on for six, eight, or ten days; rarely extends to the third week, and is then interrupted by remissions and seeming improvements. *Fourth.* The disease may be distinguished mostly by the appearance of the patient; by the succeeding attacks; their origin from a determinate cause, and their course; by the intervals of ease between the attacks; by their suddenness and progressive increase after a certain period; and finally, by insurmountable costiveness. Rokitansky rejects all medicine, especially purgatives, and proposes the knife as the only means of relief.—J. F. S.]

II.—Of Ruptures of the Chest.

Chaussier; in Journal de Médecine, par Leroux. March, 1814.
Vergne, sur les Hernies des Poumons. Paris, 1825.

1257. *Ruptures of the Chest* are very rare and no other part than the lungs can easily be contained in them (*Hernia Pulmonum*, Lat.; *Lungenbruch*, Germ.; *Hernie des Poumons*, Fr). They are either congenital, and resulting from imperfect development of the walls of the chest, or they occur subsequently, by destruction of the walls of the chest, without wound of the general covering; for instance, by extensive fractures of the ribs, by tearing of the intercostal muscles, by severe cough (1), by destruction of the ribs, and so on. After such injuries, the lungs, on account of great extent and mobility, more frequently form ruptures, if they are not adherent to the surrounding parts (2).

[(1) Gratelup (*a*) describes a protrusion of the lung between the sixth and seventh rib on the left side, which occurred during coughing. The swelling was soft and elastic, an inch and a-half long, and three quartes of an inch wide, and was painful at every inspiration. Gratelup returned it, and applied a pad with a bandage, after which the patient had no more inconvenience, and recovered.

(2) Richter says, that "Sabatier told him of a soldier who at the battle of Rosbach was wounded in the chest. The corresponding portions of two ribs which had been shattered by the ball were lost. The opening however closed, but the broad soft scar soon yielded after the cure, and formed a bag which at every breathing alternately sunk and rose again." (p. 4, 5.)]

1258. If a pulmonary rupture occur after any of the just-mentioned occasional causes, a soft elastic swelling is produced, which gradually enlarges, often brings on a painful dragging, which ceases when the swelling is returned. Its enlargement corresponds with the movements of the chest in respiration.

1259. Such rupture may be easily kept back, by means of pressure, but no radical cure is to be hoped for, because the disease is grounded in a solution of continuity of the ribs or intercostal muscles, which cannot be restored.

(*a*) Richter's Abhandlung von Bruchen. Edition, 1785.

[As the lungs are occasionally found out of their proper cavity in consequence of deficient formation of the chest and other causes, so is also the heart; and this condition, whether it be simply unnatural position within the chest itself, or actual removal from it in a greater or less degree, is called *displacement of the heart* (*Ectopia Cordis*, Lat). When the congenital displacement is *within* the chest, the heart may be situated either, *a*, horizontally, which is very rare; *b*, vertically in the centre of the chest, as quoted by Breschet (*a*); *c*, vertically with its apex upwards and between the lungs, and its base with the large vessels as low as the navel, as in De Torries' case (*b*); or *d*, the heart may be more or less to the right side, and its apex pointed in the same direction, or it may be placed completely on the right side, with or without transposition of the *viscera* of the belly, as in Breschet's four cases (*c*). Similar examples have also been noticed by other writers.

When the heart is congenitally displaced *without* the chest, it may be either on the surface of the body, or beneath the skin. Of the former kind Breschet speaks of cases "connected with deficiency in the *diaphragm* and abdominal muscles, in which the heart, liver, and stomach, sometimes also the lungs and all the abdominal *viscera* are contained in a sac, sometimes covered only by *peritoneum*, sometimes by an extension of the common integuments, and sometimes occupying the sheath of the umbilical cord, forming a variety of umbilical rupture." (p. 25). O'Bryen has also given an account (*d*) of partial displacement of the heart, consequent on absence of the ensiform cartilage, and part of the *recti* muscles and *diaphragm*, in which a portion of *pericardium*, containing the tip of the left ventricle, preternaturally lengthened, protruded, together with part of the arch of the *colon* immediately beneath the integument. The child lived three months, and the heart appeared to be insensible to the touch. Or the protrusion may depend on fissure, or deficiency in the ribs or breast-bone. Of the *latter* kind of displacement Ramel (*e*) mentions a case in a girl of ten years, in whom the heart was placed below the *diaphragm* in the situation of the stomach. Deschamps (*f*) relates the case of an old soldier, in whom the heart was found in place of the left kidney. Breschet gives an account of three cases in which the heart was found in the neck.

Displacement of the heart *after* birth may occur at any period, most commonly by various kinds of diseases; but Stokes has related (*g*) a "case of probable dislocation of the heart from external violence," in which the person having been crushed between a water-wheel and the embankment supporting it, had two of the lower ribs on the left side, the fifth, sixth, and seventh on the right side, and the right clavicle and *humerus* broken. For the first three hours he was completely insensible. He afterwards felt great pain in the right side of the chest, with a sensation as if a foreign body preventing respiration had been introduced into the right lung; the pain was accompanied with violent throbbing and heaving, and it was soon discovered that his heart was pulsating at the right side of the *sternum*. The person himself is quite positive that before the accident his heart beat on the left side, and was the first to notice its altered position. He recovered, and was subsequently able to follow his usual habits of hunting and shooting.

Actual protrusion of the heart (*Hernia Cordis*, Lat.; *Herzbruch*, Germ.; *Hernie du Cœur*, ou *Cardiocèle*, Fr.) is very rare, even congenitally. Chaussier gives the account of one case, a female infant in whom there was a soft roundish swelling about an inch high, and two and a quarter inches broad at the upper and fore-part of the belly, in which on the slightest inspection, the form and various movements of the heart and the dilatation and contraction of its ventricles were observed. Its size varied according to the different states of respiration; when the child inspired, the heart rose and seemed partially retracted into the chest, but when she expired the heart was driven forwards and downwards and the motions of the ventricles were very manifest. The swelling gradually increased in bulk, and enlarged when the child cried, especially when she was held upright; but it became softer and

(*a*) Sur l'Ectopie du Cœur; in Repert. Génér. d'Anatomie et de Physiologie Pathologiques, &c., vol. ii. p. 9. Paris, 1826. 4to.

(*b*) Philos. Trans., vol. xli. p. 776, 1741.

(*c*) Memoire sur l'Ectopie du Cœur; in Repertoire Général d'Anatomie.

(*d*) Transact. of Provinc. Med. and Surg. Assoc., vol. vi. p 374.

(*e*) Journal de Médecine, vol. xlix., p. 423.

(*f*) Journal Génér. de Méd., vol. xxvi. p. 275.

(*g*) Edinburgh Medical and Surgical Journal, vol. xxxvi. p. 44.

smaller when she was quiet and laid down. Gentle pressure also diminished the size of the swelling. As far as could be ascertained there was a large opening on the left side of the chest, below the edge of the fourth rib: some of the ribs below were deficient at the aperture. The child was well and healthy. CHAUSSIER also mentions the case of a soldier, twenty-seven years old, in whom all the breast bone was deficient below the first pair of ribs. The five following pairs of ribs had no cartilages, but the seventh pair had cartilages, and united with each other at the mesial line. The interspace thus left on the front of the chest was large oblong, and seemed covered only by skin, and all the movements of the heart could be perceived through it: but there was not any protrusion. The man was perfectly healthy, had served several years, and sustained the ordinary fatigues of a soldier's life (*a*).]

III.—Of Ruptures of the Brain.

CORVINUS, Dissert, de herniâ cerebri. Argent, 1749.
SIEBOLD, C., Collectio observationum medico-chirurgicarum. Fasc. i. art. i. De hernia cerebri. Würzeb., 1769.
FERRAND, Mémoire sur l'Encephalocèle; in Mémoires de l'Académie de Chirurgie, vol. ii. p. 61.
OEHME, Dissert. de morbis recens natorum chirurgicis. Lips., 1773.
HELD, Dissert. de herniâ cerebri. Giess., 1777. 4to.
SALLNEUVE, Dissert. de herniâ cerebri. Götting., 1792. 8vo.
NIEMEYR, De herniâ congenitâ. Halæ, 1833.
THIEMIG, Dissert. de herniâ cerebri. Götting., 1792. 8vo.
EARLE, HENRY, in Med.-Chir. Trans., vol. vii. p. 427.
LIPSCHITZ, Encephaloceles acquisitæ cum abscessu cerebri observ. Regimontii. 1828.
OTTO, A. W., Lehrbuch der pathologischen Anatomie, vol. i. Berlin, 1830.
BECK; in BUSCH, VON GRAEFE und AND. Encyclopädisches Wörterbuch, vol. xvi. p. 169, 1837, Article *Hernia Cerebri* (*b*).

1260. *Cerebral Rupture (Hernia Cerebri*, Lat.; *Hirnbruch*, Germ.; *Hernie du Cerveau, Encephalocèle*, Fr.) is a swelling, depending on the protrusion of the brain through an opening in the bones of the skull, and overspread by the external coverings. It is either *congenital*, or *may arise accidentally after birth;* in the former case, the brain protrudes through some place corresponding to the sutures; in the latter, through an opening caused by loss of substance.

[The definition just given of this ailment, which is the true one, shows that the term *hernia cerebri*, as used by English surgeons, is most improperly employed, inasmuch as the disease which they so name has no resemblance to a rupture or protrusion of the brain from its proper cavity and enveloped in its natural coverings, but is consequent on a tearing through of its investing membranes, and a luxuriant granulating process of the brain itself, for the repair of a direct injury, resulting from external violence, by which that organ has been wounded; or to fill up the deficiency which the ulceration excited by irritation and subsequent suppuration, consequent on inflammation and ulceration of the *dura mater*, set up by *necrosis* of the neighbouring skull-bone, has produced. The *hernia cerebri* of British surgeons, upon which the best paper is that of STANLEY (*c*), is in fact, no brain-rupture at all;

(*a*) I have extracted these cases from HUFELAND und HARLES' Neues Journal der praktischen Arzneikunde, &c., who quote them from a paper of CHAUSSIER'S in LEROUX'S Journal de Medecine, March, 1814; but I cannot find it there, or in the neighbouring volumes.—J. F. S.

(*b*) I have freely availed myself of this excellent article, which is the best I have met with on a subject little attended to in this country.—J. F. S.

(*c*) Cases of Hernia Cerebri, with Observations; in Med.-Chir. Trans., vol. viii. p. 12.

it is merely a luxuriant, or so-called "fungous" growth of a brain-ulcer to fill up its cavity, and is nothing more than a neglected active healing ulcer, of which the attempts for its self-cure being too vigorous, assume effectually an unnatural condition, and thus prevent the reparation of the injury they were intended to cure. This state of the brain has been already noticed (*par.* 450, vol. i. p. 425); and it must not be confused with that now under consideration, of which a very excellent account has been given by Beck (*a*); nor with the blood-swellings of the heads of newly-born children, which will be noticed hereafter.—J. F. S.]

1261. *Congenital Cerebral Rupture* is the consequence of an incomplete or retarded formation of the skull-bones, the interspace being filled only by fibrous membrane, through which the brain, when in a diseased state of expansion, as in *hydrocephalus*, protrudes (1). It occurs most commonly in the middle of the occipital bone, in the region of the great occipital hole, or at the posterior fontanele; it may be, however, at any other part of the skull, where the bones are still separate. It is characterized by a swelling of various size, covered by the integuments of the skull, which are thinned on the top of the swelling, and deprived of hair. The aperture, by which the brain protrudes, is irregular, and the swelling usually fluctuating, can rarely be much diminished by pressure, and recurs when left alone; the edge of the bone is felt at its base, and the swelling has usually some pulsation. The symptoms vary according to the size of the rupture; if it be small, there is generally no particular disturbance, when the swelling is properly protected from external violence. In large cerebral ruptures, there arises from the weight of the swelling, tearing of the brain, and so on, pain which the child shows by slight moans and sighs, and which may be relieved by proper support and covering of the tumour. Children, with large cerebral ruptures, commonly die early, and pass their short life in continual stupefaction; are often sick, badly nourished, and are frequently convulsed. The swelling may inflame and burst, and the patient then soon dies. Several cerebral ruptures may exist at once. Those affected with cerebral rupture often live long, and frequently, without any disturbance of the bodily or mental powers being thereby caused.

Held (*b*) saw a cerebral rupture, in a girl of twenty years; Guyenot (*c*), in a man of thirty; Richter (*d*), in a man of sixty; Lallemand (*e*), in an imbecile girl of twenty-three years; Wedemeier (*f*), in a young man of eighteen, who was small, imbecile, and almost speechless.

On examination of congenital cerebral rupture, the *galea aponeurotica* and *dura mater*, are found tolerably united together beneath the external skin. In the sac formed by them is a large or small portion of brain, covered by the *tunica arachnoidea* and *pia mater;* the entire surface is moistened with serous vapour; and frequently there is a considerable quantity of serous fluid. No adhesions have been hitherto observed in this rupture. The condition of the displaced brain is similar to that within the skull, but surrounded at its base with a groove. A part of the ventricle, expanded with water, may be contained in the rupture. Not unfrequently is cerebral rupture accompanied with *spina bifida*.

[(1) Otto observes (*g*) on this point, that it (*Watery Rupture of the Brain; Hirnwasserbruch*, Germ.; *Hydrocephalocèle*, Fr.) "seems to depend rather on a diseased partial enlargement of the brain, which, if not in all, certainly in the greater number of instances, depends on *hydrocephalus*, rather than on deficient development of the skull-bones, which seems only to be consequent on that condition." (p. 409.)

(*a*) Above cited.
(*b*) Ibid.
(*c*) Ferrand, above cited.
(*d*) Comment. Soc. Goetting, vol. xv. p. 21.
(*e*) Boyer, Traité des Maladies Chirurgicales, vol. v. p. 201.
(*f*) Von Graefe und von Walther's Journal, vol. ix. p 126.
(*g*) Above cited.

And "although in some cases, perhaps, a simply hypertrophy of the brain may cause cerebral rupture, yet *hydrocephalus* is usually its cause; therefore almost all the well-observed cases of cerebral rupture have distinctly shown this; and I have also noticed it in the cases which I have observed. In PENADA's case (*a*) much water constantly trickled from the cerebral rupture; and in EARLE's case (*b*) the water again collected after having been drawn off. BARON (*c*) has related an instance of a female child who was born with a remarkably large head, which at the end of a month measured twenty-nine inches in circumference. "The circumference did not farther enlarge, but a swelling began on the top of the head, over the posterior fontanelle, which, in the space of another week acquired the magnitude of a goose's egg. At this period of the disease the mother, on going one morning to take up the child, was very much surprised to find that the swelling had become much smaller, and perfectly soft. She observed likewise a constant dribbling of water from the urinary passages, and that the bed was soaked with the discharge. It continued incessantly for three days and three nights. By this time the swelling had entirely disappeared, the head was considerably smaller, and the integuments which before were very much distended, now fell in large wrinkles over the child's forehead, so as actually to cover the eyes." (pp. 51, 2.) After two months the discharge by the urinary organs diminished, the head acquired greater size than before, "having on this occasion extended itself over the whole of the head and face. * * * A watery discharge, tinged with blood, was seen to ooze from the nostrils and mouth. It continued without ceasing for three days, when the swelling on the top of the head had vanished, and the head itself was much smaller. The fluid never again accumulated in the sack on the outside of the head, nor did the head ever gain its former magnitude, because the discharge from the nostrils was kept up, with slight intermission, till the time of its death," (pp. 52, 3,) which occurred about eleven months after. BARON observes in explanation, that "the expansion of the brain, its membranes, and of the *cranium*, seems to have gone on till the parts would stretch no longer, when the rupture took place which caused the first swelling and established a free and large communication between it and the interior of the brain." (p. 55.)

In very rare cases the fluid is contained between the brain and its membranes, and protruding, the latter forms its only contents as in TEXTOR's (*d*) and THOMPSON's (*e*) cases.

Sometimes a portion of the *cerebrum*, sometimes a part of the *cerebellum* is contained in these ruptures, and an instance is given in which the whole *cerebellum* was found in a rupture through the occipital bone (*f*). There is also usually fluid on which account the disease has been named *hydroencephalocèle*.

Congenital cerebral rupture is considered by MECKEL (*g*) to arise either from collection of fluid in the brain, or on its surface, in which case a portion of the brain and its membranes are protruded. And as to its more frequent occurrence on the occipital bone than elsewhere, OTTO says, that this happens because "the occipital bone consists of several pieces of bone, which only at a more advanced period unite, and that the water collected in the posterior horn of the ventricle can act more powerfully upon the four pits formed by the *dura mater* in the occipital bone than upon the other parts, which rather form an inclined plane." (p. 412.) And he says, that in this case "the brain penetrates through the enlarged occipital hole, and the cleft upper *vertebræ* of the neck, or through special holes in the shell of the occipital bone, or at its upper angle." (p. 410). Among the more rare positions of this rupture must be mentioned the cases mentioned by MOREAU (*h*) and RICHTER (*i*) in which the swelling appeared at the root of the nose and still more rarely, where it protrudes into the orbit, the nostril and the sphenoidal sinus.

These swellings sometimes are much larger than the head itself, of which a case

(*a*) Saggio d'Osservazioni e Memorie, vol. i. p. 15. Padova, 1793. 8vo.

(*b*) Medic. Chir. Trans., vol. vii. p. 427.

(*c*) History of a case of Rupture of the Brain, and its Membranes, arising from the accumulation of fluid in a case of Hydrocephalus Internus; in Med. Chir. Trans, vol. viii. p. 51.

(*d*) Neue Chiron., vol. i. p. 469.

(*e*) London Medical Repository, vol. ii. p. 353. 1824.

(*f*) KOLBMANN in SIEBOLD's Journal für die Geburtshulfe, vol. iv. p. 150. 1823.

(*g*) Handbuch der Pathologischen Anatomie, vol. i. p. 301. Leipzig, 1812. 8vo.

(*h*) Dictionnaire de Medecine, vol. viii. p. 51.

(*i*) Comment. Soc. Gotting, vol. xv. p. 29. 1804.

has been recently mentioned by Forgemol (*a*); in this instance the circumference of the head above the ears was only 26 centimètres, whilst that of the tumour was 30 centimètres.

Congenital cerebral rupture sometimes appears to be double, either in consequence of the little yielding of the falciform process of the *dura mater*, and of the longitudinal sinus; or by a tendinous band dividing it into two halves, as in Wepfer's case (*b*), which lived till six years old. These, however, must not be confounded with the actual duplicity of the hernial tumour, "twice noticed" by Otto "at its commencement in one case, and perfectly formed in the other, where the one was again divided into two halves. And in Billard's case (*c*) the scar above the hernial rupture appeared to have been a second rupture."

The cure of these ruptures has been denied, but Otto cites two instances, Billard's, just noticed, and one of Meckel's (*d*), in which it occurred; "scarred spots being found where in the *fœtus* the water had escaped, and the brain seemed to have fallen together." (p. 412.)]

1262. In *Accidental Cerebral Rupture*, the brain protrudes gradually, by means of its alternating pressure, at the spot where a previous injury of the skull has formed an opening, which is only closed by a cellulo-fibrous substance. As the scar has not the extensibility of the coverings in congenital rupture, so accidental rupture never acquires its size. The swelling always pulsates, increases somewhat during expiration, and lessens somewhat during inspiration. If the swelling can be returned, the edge of the opening in the bone may be felt.

["The acquired cerebral rupture is," says Beck, "so rarely observed that nothing decided can be mentioned as to its progress. If the case mentioned by Lipsius be considered as *hernia cerebri acquisita*, it may be concluded from it, in reference to other cases, that the danger of this condition depends on the disposition of the brain to ulcerative destruction, formation of abscess, and secondary fungus." (p. 176).

This, truly, is not saying much, and indeed Chelius's observations are not more to the purpose. I do not know of any instance where, after the filling up of the opening in the skull which has been consequent on the loss of bone, either by the violence itself which has broken it, by the surgical operation which has removed it to relieve the brain from pressure, or by exfoliation, the result of direct injury or constitutional disease locally affecting the skull bone, the protrusion of the brain with its cellulo-fibrous covering has taken place. Indeed, when from either of these causes an aperture has been formed in the skull, and the corresponding wound of the soft parts around it has scarred by its edges inosculating, if the term may be permitted, with the exposed *dura mater*, of which the surface first granulating, either itself becomes converted into a thin skin, or is covered with skin shooting from the surrounding scalp; in such cases, instead of any protrusion of the brain and its covering membranes, there is a seeming depression, which, however, is really only correspondent to the thickness of the bone lost, and not an actual dropping into the cavity of the skull of the cellulo-fibrous substance, which fills up the hole left by the deficient bone. The edge of the bony aperture in these cases is almost invariably thin, scaly, and sharp, as if there had been an unsuccessful attempt to convert the cellulo-fibrous substance into bone. The pulsations of the brain are, when the patient is unexcited, sometimes, though not always, distinctly perceptible through this substance for some little time after the scarring has been perfected; but sometimes, even whilst the *dura mater* is granulating, little or no beating of the brain is observable. As, however, the scar becomes older and tougher the pulsation becomes less and less perceptible, and at last entirely ceases. But though such is the case under ordinary circumstances, yet if, from any cause, the patient be agitated and the circulation quickened, the throbbing of the brain against the cellulo-fibrous scar is distinctly visible, and subsides only as the agitation passes off.

(*a*) Bulletin de l'Acad. Roy. de Médecine, vol. x. p. 1024. 1845.

(*b*) Obs. de Affect. Capit., p. 46. Scaphusii, 1717.

(*c*) Traité des Maladies des Enfans nouveauxnés, &c. Paris, 1828. 8vo.

(*d*) Descript. monstrorum nonnullorum, p. 57. Lips., 1826.

This I have frequently observed, as every one must, who has seen large apertures in the skull, from whatever cause resulting, scarred over.

The cellulo-fibrous scar has a very smooth and highly polished surface, at first of a reddish colour, but subsequently as white or whiter than the surrounding skin; and more or less small blood-vessels are seen meandering upon it, which often remain after the general vascularity of the scar has diminished, and it has become white. Like all other newly-formed parts, its vitality is not great, and consequently, it not unfrequently ulcerates superficially, heals up slowly, and again and again ulcerates and heals up in like manner. Although tough and resisting, it is not sufficiently stout to protect that part of the brain it covers from pressure; and therefore, if the fingers be applied on it sufficiently firmly, the brain being pressed, its functions are disturbed, and convulsions, with the ordinary symptoms of compression, are produced. On the other hand, a sudden and large impulse of blood may so increase the bulk of the brain as to drive it against the cellulo-fibrous scar with sufficient force to burst through it. A very remarkable instance of this kind is mentioned by JAMIESON (*a*) in a girl of thirteen years, who, having fallen from the roof of a house, "broke and shattered her *cranium* at the place where the sagittal and coronal sutures meet, making a depression of the bone of about four inches in diameter;" for which she was trepanned, and "the depressed pieces of bone being all found separated from the neighbouring sound bone, were all brought away, and so left a terrible chasm in the *cranium*." (p. 217). In three months the integuments were cicatrized, but she continued to wear a plate of lead which had been applied over all the dressings on the fifth day after the accident, for five months, "but then, thinking herself secure, she laid it aside, and continued well seven months more, when the kink-cough, (whooping cough,) then epidemic in the place, seized her, and was so violent one night when she was in bed, that the *cicatrix* in her head was lacerated, and the brain was pushed out at the teguments. Being instantly called for, I found above two ounces of the brain lying on the scalp." (p. 218). Entire paralysis of the limb ensued, but she had still the use of her reason and tongue; was much inclined to sleep, had a low depressed pulse, *anxietas cordis*, and involuntary discharge of urine. After continuing in this state for five days, she died; but unfortunately no examination of her body was permitted.—J. F. S.]

1263. Accidental cerebral rupture is distinguished from the so-called fungus of the *dura mater*, by its origin; further, by its usually only occurring in more advanced age, and is preceded by pain, stupor, and the like.

The congenital cerebral rupture may be distinguished from the *blood-swellings* of new-born infants, especially by the latter, in general, being seated on the sides of the head, and being unaccompanied with any symptoms of disturbed cerebral functions; whilst congenital cerebral rupture always arises on the region of the suture. Both *cerebrum* and *cerebellum* may be protruded (*b*), and the greater part of the brain contained in the swelling (*c*).

TREW (*d*), LE DRAN (*e*), and others, have described cases of cerebral rupture occupying the right parietal bone, but they are the less to be relied on, as in neither case was there any anatomical examination. The occurrence, however, of cerebral rupture in other parts than the sutures, is proved by anatomical examination (*f*).

Cerebral rupture is distinguished from *watery cysts* on the head of newly-born children, with which it agrees in reference to its seat, and by

(*a*) The Brain forced, by coughing, through the cicatrice of a wound of the head, &c.; in Medical Essays and Observations, published by a Society in Edinburgh, vol. ii. p. 217.

(*b*) LALLEMAND and BAFFOS; in RICHERAND, Nosographie Chirurgicale. Fourth Edition, vol. ii. p. 318.—BOYER, above cited.

(*c*) ISENFLAMM; in Archives Générales de Médecine, vol. iv. p. 229.—Gaz. Méd., 1834, p. 667.

(*d*) SANSON; in SABATIER, Médecine Opératoire, vol. iii. p. 409.

(*e*) Commerc. lit. Noric., an 1738, p. 412.

(*f*) Observations de chirurgie. Paris, 1771, vol. i. obs. i.

pressure on it causing cerebral symptoms, by its pulsation and great firmness; the *diagnosis*, however, is difficult when, as frequently, a collection of water occurs with cerebral rupture (*a*).

1264. The *treatment* of congenital and accidental cerebral rupture, consists in returning and retaining the swelling within the skull, for which purpose a sufficient degree of compression is employed by bandages dipped in astringent fluids, or by apparatus of leather, or less suitably, of metal, to such extent, as not to produce any symptoms. Small congenital cerebral ruptures may thus be radically cured, which is not to be expected with those arising from accident (*b*). If the cerebral rupture be large, and the reduction impossible, the swelling must be supported and protected from external pressure. In such cases the puncture of the swelling has been proposed in order to discharge the fluid and lessen the bulk of the swelling. This practice is always very dangerous, although it has been practised with success. The puncture should be made with a fine needle or lancet, and after emptying, the aperture is to be closed to prevent the entrance of air.

Punctures have been made very frequently with successful result (*c*) (1).

Tying the swelling (Schneider) (*d*), and incision with the view of extirpation, under incorrect *diagnosis* (Lallemand) (*e*), and the removal of part of the protruded brain (Stanley) (*f*) (2), have had fatal results. Opening the swelling has sometimes first discovered the incorrectness of the *diagnosis*, and a dry dressing, with slight pressure, has been employed till the brain has returned, and complete scarring of the hole in the skull (*g*) has taken place.

[(1) Henry Earle mentions (*h*) the case of a female child born with transparent globular tumour at the back of the head which in eight days had increased to the size of a billiard-ball; it "appeared to be in its nature similar to the disease termed *spina bifida*, and to consist of an expansion of *dura mater*, containing *serum*, in consequence of a deficiency of bony or other support at this part." He made three punctures with a common needle, and let out three drachms of fluid. The punctures had not healed two days after, and pressure again discharged the same quantity of fluid. Two days after, the punctures had healed, and the sac was again full; it was then pricked with a very fine trocar-made needle and *canula*, and an ounce of *serum* drawn off. Five times after, at intervals of from two to four days the puncture was repeated, and at the last little fluid was evacuated, and the sac, having collapsed, thickened. For sixteen days the case went on well, but then the sac inflamed, patches of skin came away, and a thin *ichor* discharged from the whole surface. Three days after, the tumour was as large as ever, but opaque and very vascular; it was then punctured with a lancet, and half an ounce only of fluid discharged. Twice afterwards, the tumour was again emptied with the lancet; but two days after the last puncture, the surface of the swelling inflamed, and on the day following, the flap of the last opening began to ulcerate, and in two days more extended down to the cavity of the sac by a small aperture through which the *serum* continued to ooze. Three days after she died, without any symptoms of inflammation or effusion on the brain. Adams mentions a case which was punctured seven times, the skin gradually thickened, the secretion of fluid diminished, but protrusion, probably a small portion of the *cerebellum*, remained. The child recovered.

Puncture is not, however, free from danger. Corvinus mentions a case (*i*) in

(*a*) Hoefling, Zwei Fälle von Hirnbruch; in Casper's Wochenshrift, 1835. No 23. Compare also Naegele. Ueber den angebornen Hirnbruch und die Kopfblutgeschwülste Neugeborner in diagnosticher Hinsicht; in Hufeland's Journal, 1822, May, p. 1.

(*b*) Sallneuve, above cited.—Martini; in Froriep's Notizen, vol. xi. p. 222.

(*c*) Froreip's Notizen, vol xxxvi. p. 346. —Compare Gazette Médicale, vol. iv. p. 299.

(*d*) Richter's chirurg. Bibliothek., vol. viii. p. 269.

(*e*) Boyer, above cited.

(*f*) Above cited, p. 24.

(*g*) Richter's chirurg. Bibliothek., vol. iv. p. 556; and Stanley, above cited.

(*h*) Above cited.

(*i*) Above cited, p. 336,

which the large swelling was opened by Fried, and death ensued. Seiler (*a*) performed this operation, and the child died comatose on the third day. Von Graefe (*b*) punctured with a trocar and *canula*, and left in the latter to allow the escape of the fluid; but the swelling becoming painful, and assuming a dusky colour, it was withdrawn, convulsions ensued, and the child died.

Pitschaft (*c*) relates two cases of suppurating protrusions in children, in which some of the brain oozed out, and which were cured by the application twice a day of linen spread with honey, with large compresses dipped in decoction of oak bark; and the internal exhibition of acorn coffee and cooling diet. The children's intellect was uninjured.

(2) Stanley's cases are improperly introduced here; they were all fungous growths of the brain, soon after the removal of portions of the skull which had been depressed. Two of the boys died and one lived.—J. F. S.]

C.—Of Prolapses.

1265. A *Prolapse* (*prolapsus*, *Procidentia*, Lat.; *Vorfall* Germ.; *Chute*, Fr.) is the partial or complete protrusion of an organ out of its cavity, so that it comes into immediate contact with the external air; in which consists the difference between prolapse and rupture.

1266. The common causes of prolapse, are tearing or relaxation of the natural attachments, or of the openings, and diseased changes of the organ itself.

1267. As the prolapse of the brain, lungs, and bowels have been already considered with their respective wounds, there remains only to be here considered, *prolapsus of the vagina*, *of the womb*, and *of the rectum*.

I.—OF PROLAPSE OF THE WOMB.

(*Prolapsus Uteri*, *Hysteroptosis*, Lat.; *Vorfall der Gebärmutter*, Germ.; *Chute de la Matrice*, Fr.)

Chopart, Dissert. de uteri prolapsu. Paris, 1722.

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Sabatier, Sur les Déplacements de la Matrice et du Vagin; in Mém. de l'Acad. de Chirurg., vol. iii. p. 361.

Klinge, Commentatio de uteri procidentiâ usuque pessariorum in hoc morbo. Götting., 1790.

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Bachmann, Dissert. de prolapsu uteri. Duisb. 1794.

Meissner, Die dislocationen der Gebärmutter und der Mutterscheide von Seiten ihrer Entstehung, ihrer Einflusses, und ihrer Behandlung dargestellt. Leipz. 1821, vol. i.

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Clarke, Sir C. M., Bart., Observations on those Diseases of Females which are attended by Discharges. Part I. Third Edit., 1831. Large 8vo.

Boivin, Madame, et Dugé's Maladies de l'Uterus. Paris, 1833; 2 vols. 8vo.,

(*a*) Rust's Chirurgie, vol. viii. p. 411.

(*b*) von Graefe und von Walther's Journal, vol. xix. p. 162.

(*c*) Hufeland und Osann's Journal für praktischer Heilk. 1832, Oct., p. 56.

and translated by G. O. Hemming, M. D., as On the Diseases of the Uterus; with Notes. 2 vols. 8vo. London, 1834.

Ramsbotham, F. H., M.D., Lectures on the Morbid Affections of the Puerperal and Pregnant States, the Organic Diseases of the Uterine System, &c.; in London Medical Gazette, vol. xvi. p. 529. 1834–5.

Blundell, James, M.D., Observations on some of the more important Diseases of Women. Edited by Castle, T., M.D. London, 1837. 8vo.

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Richter, A. G. Chirurgische Bibliothek, vol. iii.

Ulsamer, M.D.; in Busch, von Graefe und and. Encyclopaedisches Wörterbuch. Article, *Gebärmutter Dislocationen*, vol. xiii., p. 557.

[Geddings. Observations on the Operative Procedures employed for the relief of Procidentia Uteri. American Journal of the Medical Sciences, vol. 26, p. 357. Philada. 1840.—G. W. N.]

Besides the works on Diseases of Women by E. v. Siebold, Jörg, Dewees, and others.

1268. *Prolapse of the Womb* designates that displacement of the womb in which it descends more deeply into the *vagina*. According to its greater or less considerable descent, is it called *complete or incomplete prolapse*. It may also be accompanied with *inversion of the womb*.

["The descent of the womb," says Sabatier, "has three different stages, to which have been given the names *relaxation*, *descent*, and *fall* or *precipitation*. When it is only in its first, or even in its second stage, the womb descends more or less in the *vagina;* a pear-shaped tumour is felt, around which it is easy to carry the point of the finger, and which is pierced at its extremity by a transverse aperture. This tumour is situated higher in relaxation, and lower in descent of the womb. When, on the contrary, the disease has arrived at its third and last stage, the womb is precipitated completely out. It carries with it then the *vagina*, doubled upon itself, and a part of the bladder which is very adherent. Many even of the floating bowels of the lower belly sometimes sink into the kind of *cul-de-sac* formed by the *vagina*, and render the tumour monstrously large." (p. 362.)

To the same effect are Blundell's observations. "There are three varieties," says he, "of this complaint, relaxation, *prolapsus*, and *procidentia*. When the womb protrudes beyond the *os externum*, the disease is called *procidentia;* when it remains at the outlet, *prolapsus;* when it scarcely subsides below the brim, it then constitutes what is denominated *relaxation*." (p. 33.) It will be readily perceived that Blundell's *procidentia* is our Author's Complete Prolapse, and that his *prolapsus* and relaxation are included under Incomplete Prolapse.]

1269. In *Incomplete Prolapse of the Womb*, (*Prolapsus Uteri incompletus*,) that organ descends more or less into the *vagina*, and forms a pear-shaped swelling, which protruding only whilst the patient stands, can, on examination, be swept round by the finger, and at its lower part a transverse cleft, the mouth of the womb, is felt (1). Or the womb, with its neck, descends between the external generative organs, in which case the *vagina* is at the same time inverted, and descends with it (2).

The symptoms presented by incomplete prolapse are, dull but constant pain in the rump, loins, and flanks, a weight and pressure in the *vagina*, frequent need of going to stool, often violent urgency, and difficulty in discharging the urine (3). All these symptoms increase if the patient standing long, have exerted herself; and diminish or disappear entirely if she continue for a long time in the horizontal posture. If the neck of the womb have descended between the external generative parts, the movements of the body are hindered, and all great exertion rendered

impossible. The irritation which under these circumstances affects the womb, and the other organs of the pelvic cavity, may be participated in by the bowels; and the functions of the alimentary canal are often disturbed (4). At the time of menstruation all these inconveniences increase; it becomes irregular; considerable flooding frequently occurs, and is accompanied with a copious discharge of the whites.

[(1) "Of the descents of the *uterus*, the most common, perhaps the most obscure and the most troublesome, is, says BLUNDELL, "that variety in which the *uterus* descends but a little way, an inch or two into the *pelvis*, technically called *relaxation of the uterus*." The symptoms attending this condition, he observes, often lead the woman, if married, to suppose herself pregnant. If the medical attendant have any doubt of the case, "that doubt is to be set at rest by making a careful examination. If the disease exist, you will observe the upper part of the *vagina* to be very relaxed, and the womb to protrude; and were you to introduce a catheter, you would find there is a tendency to an obstruction and distortion of the *urethra*." (pp. 39, 40.)

(2) The more advanced form of incomplete prolapse BLUNDELL speaks of as "a more frequent disease than *procidentia*, complete prolapse,) and therefore still more important to be known; in which the womb comes down to the external parts, but not beyond them, and called *prolapsus uteri*." The symptoms, he observes, "are worse at night, because the womb comes down in the evening, the patient having been about all day;" this observation may indeed be also applied to relaxation. "On the whole, I should say," he continues, "that there are few diseases which are better characterized than *prolapsus uteri*" by its symptoms. If examinations be thought necessary, they "are better made in the evening than in the morning, for in the morning the womb is almost always in its place, whereas, in the evening, it is considerably descended, so that the displacement is easily recognised. To this character may be added, first, the laxity of the *vagina*, which, in its upper half, is much more capacious, so that, perhaps you might put a pullett's egg into it there, though the lower part of it may be tenser; secondly, a bearing on the *rectum*, producing irritation; and, thirdly, if you introduce a catheter into the bladder, you will find the passage more or less distorted, the instrument moving about, and perhaps turning round completely by being thrown out of the ordinary line." (p. 37–9.)

(3) The disposition to frequent voidance of the urine may arise either simply from the irritation produced by the displaced womb pressing against the neck of the bladder, or from the pressure preventing the complete emptying of that organ, or from the womb dragging it down and bending the *urethra* upon itself backwards and downwards to a greater or less extent. Upon this point RAMSBOTHAM observes: —"The more vehement the woman's efforts to accomplish the relief of the bladder, the more perfect does the obstruction appear. Nor is this difficult of explanation; because, under these forcible endeavours, the diaphragm and abdominal muscles both being called into strong action, propel the *uterus* even lower; and in this manner the pressure before existing is increased." (p. 530.)

(4) The irritation of the *rectum* is in either of the two stages now under consideration merely attributable to the pressure of the womb, and not to any dragging.

1270. In *Complete Prolapse, or Falling out of the Womb, (Prolapsus Uteri completus)*, the organ projects entirely out of the external parts of generation; the *vagina* is thereby drawn after it and doubled; the organs connected with the womb are entirely dragged out of their place; the intestines sink into the sac produced by the inversion of the *vagina*, and therefore a void is always noticed in the lower part of the belly (1). All the symptoms mentioned in complete prolapse here exist in a greater degree; voidance of the urine is specially attended with considerable difficulty, and often entirely prevented (2); qualmishness, sickness, spasm in the belly, sometimes fainting, severe febrile symptoms often occur, especially when the prolapse has taken place suddenly. The swelling formed by prolapsed womb has an oblong, nearly cylindrical

form (3), terminates below in a narrower part, on which is found a transverse opening, (the mouth of the womb), from whence during menstruation blood flows, and into which a probe may be introduced not more deeply than two inches (4). The base of the swelling is attached to the inner skin of the *labia*, by which the introduction of the fingers, near the swelling, is prevented. The tumour has at first a reddish colour, and is sensible; but by contact with the air, friction, and the moisture of the urine, and so on, it becomes inflamed; a copious secretion of mucus takes place on its surface, and it becomes gradually insensible, and overspread with a thick skin, like other parts (5). The inflammation may be severe, and run on to ulceration, and even to mortification (*a*).

(1) In reference to the size of the prolapsed womb and *vagina* and the contents of the sac formed by the latter, BLUNDELL observes:—"I have seen several cases in which the *vagina* has been forming a large tumour lying forth between the limbs; this cyst containing not merely the womb, but in part the bladder, the small intestines, the ovaries, and perhaps the *rectum*; for where you have *procidentia*, it very rarely happens that the womb only descends, generally the other *viscera* come with it, in a larger or smaller mass. A case of this kind if you are incompetent, you may mistake for *polypus*, *inversio uteri*, not to mention a large descent of the bladder only; but when you examine the tumour with care, you will frequently discover, first, that on the surface of the tumour, the *rugæ* of the *vagina* are more or less conspicuous; secondly, that you can introduce a catheter into the tumour, provided the bladder be come down; thirdly, that on passing a finger into the *rectum*, it may perhaps descend into the back of the cyst; lastly and above all, that at the lower part of the cyst, the *os uteri* may be found. Sometimes the *os uteri* is so conspicuous that you can see it at the first glance; but at other times it appears under the form of a very minute aperture, the usual tubercle being wanting." (pp. 33, 4).

CRUVEILHIER says he has seen one case of prolapse in the living subject in which the bowels descended into the inverted *vagina*, but has never met with it after death. He also observes that in consequence of the peritoneal doubling or pouch between the *vagina* and bladder being much shallower than that between the *vagina* and *rectum*, the *vagina* may be completely inverted in front, whilst it is scarcely ever so behind; and that, consequently, the vertical extent of the swelling is greater before than behind. [This observation seems to me the very contrary of what might be expected.—J. F. S.] For the same reason, he says also, that the front pouch is too slight generally to receive intestines into it, whilst the hind one may receive a large quantity, and that under such circumstances the prolapse may become as large as a man's head (*b*). (This does not appear to me a more satisfactory statement than the former, for did the hinder pouch still remain, the protruded swelling would have the form of a double sac, separated by a cleft, the front one formed by the womb itself, and the hind one by the peritoneal sac containing intestines, and thus in fact becoming a vaginal rupture. But this is not the case, at least in the few cases I have seen (as they generally fall to the lot of the man-midwife, rather than the surgeon); for in them the prolapsed part was smooth and regular, the whole circumference of the *vagina* having been included in the protrusion, and thus forming a common funnel into which the bowels descend.—J. F. S.

"Many months, or even years, may elapse," says CLARKE, "whilst the *uterus* is making this descent; for when the *uterus* has descended so far that it can rest upon the *perinæum*, there it not unfrequently remains, resting upon it as upon a shelf, the violence of the symptoms abating, the parts which suspend the *uterus* above, although much lengthened, being no longer put upon the stretch. From this circumstance it should appear that the greater number of the inconveniences attending this complaint depend less upon the pressure of the *uterus* in the *vagina*, than upon the dragging of the parts above." (p. 68).

(*a*) HAUSMANN, Dissert. de Uteri Procidentiâ. p. 58.—SABATIER, above cited, p. 362. Viteb. 1728.—SAVIARD, Observ. chirurg. Paris, 1784, FRORIEP's chirurgische Kupfertafeln, Pl. lxi.

(*b*) Livr. xxvi. p. 3.

(2) Although difficulty in voiding the urine and frequently even retention are consequent on prolapse of the womb, yet CRUVEILHIER has given (*a*) instances in which incontinence has ensued. And in the case above mentioned, in which the *rectum* was displaced, he states that there was involuntary discharge of the stools.

(3) CLARKE says that "after some time the breadth of the tumour increases, so that it becomes of a globular form." (p. 71). And farther that "the *vagina*, when dragged down by the *uterus*, sometimes undergoes such a degree of distention that its diameter will be greater than that of the *pelvis* itself. In the case of WATKINS, who died in Kensington workhouse, the tumour measured more than fifteen inches in circumference, and its length was six inches and a half." (p. 125.)

(4) CRUVEILHIER confirms BLUNDELL's observation in reference to the altered form of the mouth of the womb, its front lip being sometimes effaced whilst the hind one is very prominent. Its direction also is sometimes changed, the long axis of its aperture being from before backwards, instead of from side to side; and occasionally it is so small as to seem scarcely large enough to permit the escape of the menstrual fluid (*b*).

CRUVEILHIER states (*c*) that he has invariably observed in prolapse of the womb an elongation of that organ, accompanied with great contraction and narrowing, which occurs principally at the junction of the body with the neck. CLOQUET also gives (*d*) an instance of the same kind. CRUVEILHIER farther notices (*e*) that sometimes this elongation and at other times the descent of the womb is greatest. In some instances he found the lengthening so great that when seen within the *pelvis*, the womb appeared to occupy its proper position; and under these circumstances he considers that the disease commenced with the inversion of the *vagina*. "The lengthening of the womb," he observes, "can only be effected by previous softening, in consequence of which the organ becomes in some degree ductile; this softening may be perhaps, purely and simply the result of the slight pull upon the womb" (*f*).

(5) RAMSBOTHAM observes:—"It is worthy of remark, however, that although the local inconvenience is much more distressing when the womb protrudes without the *labia* than when it is still retained within the *pelvis*, yet the system in the former case does not suffer so much; and the reason is obvious. While the vaginal membrane is protected from the external air, its secretion is kept up, and sometimes in an extensive degree; but when exposed to the atmospheric influence it ceases to secrete, and a proportionate quantity of power is therefore saved." (p. 531.)

"It seldom happens," remarks CLARKE, "that the *vagina* remains long exposed to the action of the air without ulceration taking place upon its surface. This ulceration does not attack the whole of the exposed surface at once; small spots or patches inflame and ulcerate, and these sometimes run into each other, but the whole surface is seldom covered by them. The ulcerations are generally not deep, and they have the appearance of healthy sores, which readily heal upon the replacement of the prolapsed parts. Whenever ulcerations are met with, the *os uteri* seldom escapes being attacked by one of them." (p. 83.)

Sometimes it happens after displacement of the bladder, consequent on prolapse of the womb, that stones form either in the *fundus*, of which CLOQUET mentions (*g*) two instances, and CRUVEILHIER, one; but the latter pathologist has found a stone in that part of the bladder which had not been dragged down (*h*).

Although the *rectum* is less likely to be pulled from its place than the bladder, yet this has also happened. CRUVEILHIER, relates (*i*) an instance in which the *rectum*, dilated and filled with stool, was drawn forwards a little above its extremity, and formed a funnel-like lengthening. And CLOQUET figures (*k*) a case in which, with great enlargement of the *rectum*, a considerable finger-like process descended into the cavity of the inverted *vagina*.]

1271. The *Causes* of prolapse of the womb are predisposing and occasional. The former consist in relaxation of the natural attachments of the womb by copious, long-continued flow of *mucus*, by frequent de-

(*a*) Livr. xxvi. p. 3.
(*b*) Ibid.
(*c*) Livr. xvi. p. 2.
(*d*) Pathologie Chirurgicale.
(*e*) Livr. xxvi. p. 2.
(*f*) Livr. xvi. p. 2.
(*g*) Pathologie Chirurgicale.
(*h*) Livr. xxvi. p. 3.
(*i*) Livr. xvi. p. 3.
(*k*) Pathologie Chirurgicale.

liveries, specially if they be very quick, or difficult, and require artificial aid (1). The occasional causes are severe exertion, by which the abdominal muscles are violently contracted, raising heavy weights, violent pressure in going to stool, long-continued standing, and so on. They cause the prolapse the sooner they operate after delivery; and therefore the disease occurs most commonly in women of the lower classes who have often borne children (2). In those who have not borne children it is but rarely observed, and then severe violence must always operate, or the attachments of the womb be relaxed by great previous flow of *mucus* (3). During pregnancy the womb cannot easily protrude, and a considerable prolapse is itself removed by the ascent of the womb. Cases are mentioned (*a*) in which prolapse has occurred during pregnancy, and even during delivery (4); in such, violent straining must have operated, and the diameter of the *pelvis* have been of great size. Any diseased change of the womb which increases its weight, for instance, polyps and so on, or swellings which press upon it, may favour its prolapse (5).

[(1) Among the causes of prolapse of the womb, BLUNDELL notices especially, a large *pelvis;* and he observes, that "this descent of the *uterus*, to which all females may be subjected, when the parts are relaxed, occurs certainly most frequently where the *pelvis* is capacious, and not only in the *earlier* but sometimes in the *later* periods of gestation." (p. 116).

(2) RAMSBOTHAM observes, that "in the higher circles, indeed, these (last) causes do not obtain; and in them, therefore, we more often find it consequent on miscarriage or accompanying a broken state of health. All women are aware of the necessity of confinement after delivery of a mature *fœtus*, and consequently if they have it in their power, they willingly follow the course prescribed for them. But when they have passed an *ovum* of only two or three months' age, as they have suffered but little pain and less discharge, and as they had scarcely been sensible of any enlargement in their person before the miscarriage commenced, they consider the occurrence of little import; they think confinement to the horizontal posture for two or three days quite sufficient, and feel a longer restraint irksome, and in spite of advice and remonstrances will busy themselves about their domestic affairs, while still the *uterus* is much too bulky and heavy to be sustained by its natural supporters." (p. 530).

He also states that "a violent fit of coughing occurring soon after labour or abortion, or an attack of sneezing, although the woman may still retain the recumbent posture, is likely to produce *prolapsus;* and it may be occasioned by a rupture of the back part of the *vagina* and *perinæum*." (p. 530.)

(3) A remarkable instance of prolapse of the womb in a young woman (a virgin) was under ELLIOTSON's care in St. Thomas's Hospital, in 1828 (*b*). She stated that "whilst lifting a person out of a coach, she suddenly felt intense pain in her back, and the *uterus* descended and protruded beyond the *os externum;* its descent was accompanied by profuse hemorrhage. She was immediately placed in bed and a surgeon sent for, who replaced the womb. In a month afterwards, feeling herself quite well, she married, and ever since (five months) that period has suffered exceedingly from pain in her back, and from repeated descents of the *uterus*, accompanied with hemorrhage." (pp. 733, 31). SAMUEL COOPER states (*c*) that he has seen two instances of prolapsed womb in maidens, in the course of seven or eight years. RAMSBOTHAM has known it twice in unmarried girls about twenty

(*a*) HARVEY, Exercitationes de Partu, p. 518.—FABRICIUS, Progr. de fœtûs vivi extractione, utero prolapso. Helmst., 1748. —HALLER's Disput. chir. sel., vol. iii. p. 434.—SAVIARD, above cited, p. 66.—DUCREUX and PORTAL; in SABATIER, above cited, p. 368.—Journal de Médecine, vol. xliii. p. 366. vol. xlv. p. 232.—MÜLLNER, Wahrnehmung einer sammt dem Kinde ausgefallenen Gebärmutter. Nürnberg, 1771.

(*b*) Lancet, 1827–28, vol. ii.

(*c*) Surgical Dictionary, Seventh Edition, p. 1838.

years of age. And other cases are related by Mauriceau, Saviard, Monro, and Cruvelhier.

(4) Ullsamer (*a*) mentions, that he had observed "prolapse of the womb to be in one village, as it were, endemic, in almost all the women who had borne one or two children; and when its cause was subsequently ascertained, it was found that the midwife of the place, who had never been instructed, put all the women, as soon as they had the slightest labour pain, into the labour-chair, which was her only mode of assistance, and let them go on and strain, till either the birth were effected or the woman could go on no longer." (p. 561.) This cause of prolapse is not likely to occur in this country, our women being put in the recumbent posture instead of on the labour-chair; but the fact is worth observation.

(5) Degeneration, accompanied with increased size of the neighbouring organs within the belly may, although rarely, cause prolapse of the womb, as dropsy, or hardening of the ovaries, of which an interesting example is mentioned by Kuhn (*b*).

Clarke observes that "*procidentia uteri* and separation between the bones of the *pelvis* may exist together in the same patient," and mentions an instance of a young lady who, after her second confinement, was thus affected. "During and after this labour there was a considerable discharge of blood, but in other respects she was well. At the end of a fortnight she found herself incapable of standing, and all the symptoms returned, as after her former labour," (pain in the back and groins, uneasiness in the region of the stomach, and impaired digestion, *hysteria*, and mucous discharge from the *vagina*, which were diminished by the use of a pessary, astringent injections, sea bathing, and tonic medicines.) By the use of the means above mentioned, the fresh water bath being used of necessity instead of the sea bath, the symptoms all left her, excepting the pain in the back, and the incapability of standing for half a minute unless supported on each side. Whenever she made the attempt to stand she placed her hands upon the sides of her hips. This led the author to make a firm pressure there with his own hands; and as long as this was firmly applied the patient could stand, but as soon as this support was withdrawn she was in danger of falling." (pp. 78–80.) She was cured by wearing for some time a leathern belt, an inch and a half wide, applied as tightly as she could bear it without pain. Clarke states that he has met with many similar cases, which recovered, but that the "progress of such cases towards health is always exceedingly slow."]

1272. The *prognosis* of prolapse of the womb depends on its degree and causes; it is, however, always doubtful in reference to a radical cure. The symptoms may be very dangerous, especially if the prolapse have occurred quickly.

1273. The *treatment* consists in the *return* of the prolapsed womb, and in the *prevention of its reprolapse.*

1274. In *incomplete* prolapse the return is unaccompanied with difficulty; the womb usually returns of itself, when the patient is in the recumbent posture. But if this do not take place, the womb, after emptying the bladder and *rectum*, must be pushed back with the fingers, which are to be placed upon it, in the axis of the *pelvis*. In *complete* prolapse the reduction is generally more difficult, especially in fat persons, and may be impossible if the womb be considerably swollen and inflamed (1). In these cases the attempts at replacement must be made in the horizontal position, with the rump raised; warm bathing, bleeding, relaxing applications, and the use of cooling remedies, having been previously resorted to; and the reduction must always be carefully made, so as not to increase the symptoms. If the womb prolapse during pregnancy, it must be returned as quickly as possible (2). If this cannot be done without efforts which may be dangerous to mother and child, it is to be feared that in the in-

(*a*) Cited at head of this article.

(*b*) Allgem. Medic. Annalen, part ii. p. 841. Altenburg, 1812.

creasing size of the womb its circulation may be so prevented as to cause gangrene; in which case nothing remains but to diminish the size of the womb by breaking the membranes, and drawing off the waters; or the womb remains lying in front of the external genitals till the completion of the delivery, which in many instances (which happens also in those prolapses occurring during delivery) is effected merely by the natural powers, in some by artificial assistance, and even by cutting into the mouth of the womb (*a*). After delivery the bulk of the womb diminishes, and the reduction is easy.

[(1) "Ruysch forbids the reduction of the prolapsed womb when it is ulcerated; but," observes Sabatier, "as this complication is only accidental, as it is only caused by the continual rubbing to which the tumour is exposed, and by the acridity of the urine with which it is bedewed, no danger is to be feared from this practice. We perceive, on the contrary, that as that which causes and sets up the ulcers with which the *vagina* and womb are affected ceases by its reduction, the ulcers will heal of themselves, when the womb is in its natural place; and experience supports the truth of this reasoning." (p. 365).

(2) "When prolapse occurs during the course of pregnancy," Sabatier says that "its reduction must be attempted, which is sometimes tolerably easy, the pregnancy being but little advanced, if the reduction be made at once, and care have been taken previously to empty the bladder and *rectum* by the catheter and by clysters, and by putting the patient in a proper position. If, on the contrary, pregnancy be far advanced, or if the prolapse have existed some time, the reduction becomes very difficult and in this case it is more prudent to leave the part hanging out rather than to weary the mother and child by unavailing efforts. The womb, however, must not be left to itself; it must be supported by proper bandages, and the patient even kept in bed to the ordinary termination of pregnancy. If the prolapse happen at the time of delivery, reduction becomes useless, and even dangerous. We must then occupy ourselves with the delivery of the child by gradually dilating the womb, which must be carefully supported during the operation, which though troublesome, presents no greater difficulty than when the womb is in its natural position. The extraction of the *placenta* requires much care. It is easy to perceive this must not be left to nature, and still less that the cord should be pulled in the usual way. The hand being introduced into the womb, the *placenta* must be detached according to Levret's method. After which the womb gradually contracts, and the reduction is tolerably easy." (pp. 369, 370.)]

1275. When the prolapse has been returned, the ailment is only of slight extent; and if it have not long existed, the patient requires to be kept several weeks on her back; in passing her motions, she should avoid all straining and sitting up, and she should use local and general strengthening remedies, as volatile frictures of the belly, astringent injections into the *vagina*, strengthening baths, especially tan baths, and so on (1). In this lesser degree of the disease, sponges moistened with astringent remedies may be introduced into the *vagina* (2). In complete prolapse the womb must, after proper reduction, be retained in its place by a mechanical contrivance, the so-called *pessary*.

[(1) Clarke says that "in *procidentia uteri*, cold water ought to be applied to the female parts, to the belly, and to the back, by means of a sponge, three or four times a day; and the water for this purpose should be used as soon as it has been drawn from the spring. The water may be rendered still colder by the addition of some matter which is passing from a solid to a fluid state, as ice or salt. Cold water may also be thrown into the *vagina* by means of a syringe, or a piece of ice may be introduced into the *vagina* and suffered to dissolve there. In very slight cases of the disease, when the symptoms are just beginning, and when they are

(*a*) Ephémérid. Natur. Curios., déc. II. an iii. p. 375.—Jalouset; in Journal de Médecine, vol. lxiii.

known to proceed from the causes which have been mentioned, they will be removed by attendance to these rules, assisted by the horizontal posture." (p. 95).

"In *procidentia* of the *uterus*," CLARKE farther observes, "astringent applications to the *vagina* become very serviceable, by diminishing its diameter, and thus rendering it less disposed to receive the displaced *uterus;* and also by restraining the mucous discharge." (p. 98). "A mixture of alum and sulphate of zinc, in such proportions as the nature of the case may seem to require, will sometimes fulfil the intentions of the practitioner better than either employed alone; and so of all the other mineral astringents which have been in use." (p. 101). Of the vegetable astringents, "*cortex quercûs*, *cortex granati gallæ*, possess a great degree of astringency. They give out their astringent properties to water more readily by boiling than by infusion, and therefore the decoctions of them are to be preferred; they may be used alone, or some of the mineral astringents may be dissolved in them. By these means are procured astringent fluids of such strength, that the *vagina* may be so much contracted as to even render the introduction of the pipe of the female syringe difficult. Astringent injections should be thrown into the parts twice or thrice a day, or oftener, and they should be used cold." (p. 103).

Upon the subject of injection, CLARKE states, that "whenever it is found necessary to inject fluids into the *vagina*, and important that they should remain there for any time, the operation should be performed when the woman is in a recumbent position; and if a pillow is previously placed under the hips, in order to raise them a little, the fluid will be less likely to escape. The syringe to be employed should be capable of holding as much fluid as will fill the *vagina*." He objects to the mode in which the holes are generally made in the syringe, by which either the fluid passes out too quickly, or little or none reaches the upper part of the *vagina*, "but if the holes are all placed at the extremity of the pipe, the injection will be thrown to the upper part of the *vagina*, and will be sure of return by the sides." (pp. 95–7).

"When ulceration has attacked the *vagina*, in consequence of exposure to air and pressure," CLARKE recommends that "a small quantity of some warm ointment be applied to the parts affected by it, such as the following:—℞ *bâls. Peruv.* ℥ij., *ung. cetacei* ℥j. M." (p. 103).

(2) CLARKE objects to the use of sponge, as "the worst material which can be employed for pessaries; it is porous, and will very quickly imbibe the moisture of the parts. The piece of sponge must be large, compared with the size of the *vagina*, or it will be useless; and if it is large, the *vagina* (the dilated state of which was one of the causes of the disease) will be still farther dilated; and although whilst the sponge is warm, the *uterus* will rest upon it, and the symptoms may be relieved, yet when it is removed the disease will return in an increased degree." (p. 112.)]

1276. Pessaries, (*Mutterkränze*, Germ.; *Pessaire*, Fr.,) in reference to their form and substance, are very various; they are oval, round, globular, cylindrical, furnished with a stem, and so on; they are made of wood, or cork, caoutchouc, and covered with wax or varnish (*a*).

1277. The oval pessary, made of cork overspread with wax, and provided in the middle with an opening not too large, is the most serviceable. It keeps its place whilst the two ends of the oval thrust against the sides of the *vagina* and *pelvis*. It is to be applied in the following way. The patient, her *rectum* and bladder having been previously emptied, lies on her back, with the rump raised, her thighs apart, and bent towards the belly, the *labia* are to be separated with

(*a*) HUNOLD, Dissert de Pessaries. Marb., 1779.—BERNSTEIN, systematische Darstellung des chirurgischen Verbandes, p. 352.—MEISSNER, above cited.—HERREZ DE CHEGOIN; in Mémoires de l'Academie de Médecine, vol. ii. p. 319.—Mad. RONDET, Memoire sur l'emploi des Pessaires de caoutchouc. Paris, 1833.—ZIMMERMANN, Erfahrungen und Mitheilungen bewährter Aërtze und Wundaërzte neurer Zeit über Prolapsus und Carcinoma Uteri nebst einer gründlichen Beleuchtung der Pessarien. Leipzig, 1834. fol. No. 148.—Gemeinsame Zeitschrift für die Geburtskinde, vol. vi. pt. i. ii.

two fingers of the left hand, and with the right hand the pessary, held flat, is to be thrust so high into the *vagina*, that the mouth of the womb may meet its aperture when it is brought horizontal, and its two ends jut on both sides against the pelvic bones. The patient must remain in the horizontal posture some hours after the introduction of the pessary to ascertain if it still keep its proper place. A large pessary must be chosen if the womb again prolapse; and a smaller one, if that introduced cause too much pressure. At the same time the strengthening remedies, already mentioned, (*par.* 1275,) must be used. If pregnancy occur, the pessary should be removed about the third or fourth month. The patient must then keep herself quiet, avoid all exertion, and, in delivery, all pressure and excitement of labour-pains.

[When the prolapse is so great that the globular pessary, which CLARKE thinks is the best, will not be retained, neither can be kept in the *vagina* by any common bandage, he recommends "a pessary to be chosen of the size which the case requires, and a small slip of brass to be attached to it by its two ends, leaving a space between the instrument and the centre of this piece of brass; a belt of leather, long enough to go round the patient's body, is also to be prepared; to the centre of which behind, a brass wire, as thick as a common quill, is to be attached by a screw. This wire is now to be properly bent, and the pessary being introduced into the *vagina*, the wire is to be passed between the pessary and the piece of brass attached to it; and being brought up between the thighs, it is to be attached to the fore part of the circular strap. The reduced parts are by this means supported by a pessary, and this is kept in its place by the unyielding piece of metal." (p. 127.)]

1278. The use of the pessary is frequently accompanied with much inconvenience, as it causes pain, inflammation, stinking discharge, suppuration, and even degeneration of the generative organs; in many cases it cannot be worn, and in many the prolapse cannot be kept up for any time (1). In such cases the only help consists in an *organic narrowing of the vagina* with or without excision of its walls, by means of the *suture*, *Elythroraphy* (HALL, BERARD,) *Colpodesmoraphy*, (BELLINI,) or by junction of the *labia* by means of the *suture*, *Episioraphy*, (FRICKE,) or by the *introduction of a ring* (2).

[(1) The use of pessaries has of late years gone much out of fashion, on account of the many inconveniences which they cause; and in their stead many of our leading accoucheurs prefer the use of a modified T-bandage upon the belly and *perinæum*. Among these, Dr. HULL's utero-abdominal supporter is perhaps the most known and commonly used in this country; and I have seen it employed very successfully several times in my own hospital patients, for whom it has been prescribed by our obstetric physicians. It does not appear certain that HULL was the real inventor of this bandage; at least, one very similar to it had been long previously made by SHELDRAKE of Leicester Square, and another and more simple had been invented many years before by KING, a Surgeon at Clifton. I am not aware, however, that any good explanation of the way in which such bandages act had been given, till HULL brought out his apparatus. He considers "*Prolapsus Uteri*, not as a displacement of the womb merely, but as a loss of that perfect equilibrium between the upper and lower portions of the *abdomen* which is essential to the preservation of the relative situations of the *viscera* it contains, and also a dislocation of the *uterus* and bladder; and in some cases, as especially dependent upon a pouch-like relaxation of the whole perinæal region. His method of cure consists in giving the weakened and relaxed portions of the muscular walls of the abdomen adequate mechanical support, which directly replaces the *viscera*, and gives back to the weakened walls their lost tone." (*a*).

(*a*) This extract I have taken from "A brief account of the application and uses of the Utero-Abdominal Supporter, for relief and cure of *Procidentia* and *Prolapsus Uteri*, patented by A. G. HULL, M. D." London. Published by WEISS, of the Strand, who is agent for these bandages. The original pamphlet, published in America about ten years ago, I have in vain endeavoured to procure.—J. F. S.

The apparatus consists of a broad soft elastic pad, covering the whole hypogastric region, upon the middle of which the front end of a spring, like that of a common truss, acts, and from the hind end a strap passes round the opposite side of the body, and fastens on the pad. "The effect of this pad is to give the weakened lower portion of the abdominal muscles a congenial support, which, at the same time that it diminishes their labour, stimulates them by the well-known power of mechanical pressure upon muscular tissue, to a permanent renewal of their vigour. It reduces the distended *hypogastrium*, aids the upward forces of the belly, and by its direction, upwards and backwards, directly relieves the pelvic *viscera* from the unnatural pressure of the downward forces." That portion of the apparatus above described, is not always "competent to the entire relief of all cases of this species of uterine displacement; the *perinæum* sometimes losing so much of its muscular and organic contractility, as not to resume its natural dimensions and situation, even when the downward forces are stayed by the hypogastric pad. In cases of this character, although the abdominal support of the apparatus does certainly relieve many of the distressing sensations of the patient, yet the distended floor of the *pelvis* remains a *cul-de-sac* for the reception of the *viscera*, whenever that apparatus is removed for a length of time. To obviate this liability, as also to give tone to the *vagina* by the stimulus of mechanical pressure, thereby to diminish its calibre, and restore it to its natural situation, the doctor applies against the *perinæum*, externally, a prism-shaped pad or cushion, made of sponge, firmly encased in cloth, which is held in its place by a strap passing between the thighs, and over the perinæal region, in the manner of a T-bandage. This perinæal cushion, with its rising and sinking in perfect accordance with the respiratory motions of the *diaphragm* and abdominal walls, keeps up an equal, firm, and, to the patient, agreeable pressure upwards, is a good substitute for the intervaginal pessaries."

Sheldrake's bandage is very similar to Hull's, but without the spring.

King's bandage is very simple, and I am informed very efficient; it is, in fact, a T-bandage, of which the circular part is in two pieces, one passing round the back of the *pelvis* from below, the upper front spine of one hip-bone to the other, and its ends connected in front by an elastic strap, rather wide in the middle, to which is attached a perinæal strap, also elastic, and padded more or less thickly in the *perinæum*, according to circumstances.

(2) Phillips (*a*), in a case of prolapsed womb, for the relief of which the patient could not bear the use of any pessary, attempted to produce a scar of the *vagina* by destroying its mucous surface with caustic, for the purpose of causing such contraction of the passage as would prevent the descent of the womb. Having introduced a three-pronged *speculum vaginæ* and freely expanded it, he liberally applied lunar caustic upon two of the exposed surfaces, and afterwards washed out the *vagina* with warm water. The application gave very little pain, but its effect did not extend beyond the *epithelium*, and when this peeled off there was not any appearance of granulating surface. Six weeks after he "used the fuming nitric acid, brushing it over a larger surface by means of a camel's-hair pencil. The pain it occasioned was greater than that which followed the use of the nitrate of silver, but still it was not severe nor long-continued. The inflammatory action was much more decided, the whole thickness of the mucous tissue sloughed, and a fair granulating surface, yielding a considerable purulent secretion, was established." (p. 495.) The descent of the womb did not at first appear to be much checked, and it was thought of bringing the sides of the *vagina* together with suture, to which however the patient would not assent. Gradually the descent of the womb diminished, and for eight months had entirely ceased, the capacity of the *vagina* having diminished to that of a woman who had never borne children.

If pessaries be used, they should be occasionally removed to cleanse them of any acrid or gritty substance which may have become attached and be likely to excite inflammation and ulceration. Clarke also remarks, "that instances too have occurred, where parts of the instrument have been destroyed by a spontaneous change taking place in it, and angular portions of it having been left, which have produced similar bad effects;" of which he gives an instance. And he also mentions a remarkable case, in which "a supposed schirrous tumour surrounding the *os uteri* was found to be a cork pessary, introduced many years before, and rendered very

(*a*) London Medical Gazette, New Series, 1838–39, vol. ii.

rough by calculous matter deposited on its surface. It was withdrawn, and all the symptoms subsided in the course of a week." (pp. 116, 17.)]

1279. According to HALL (*a*), after the womb has been forced down by the patient's efforts as much as possible, two parallel cuts should be made along the whole length of the *vagina*, from the neck of the womb to its entrance, through the mucous membrane, which is to be separated, so that an interspace of two and a half inches is laid bare between the two incisions. A stitch is then to be put in through both edges of the wound near the neck of the womb, the womb itself to be returned, and the threads tied firmly together. Several ligatures may in the same way be gradually applied (1).

IRELAND (*b*) has successfully practised HALL's method, which he has only modified with the view of avoiding more certainly the bladder and *rectum*, by making the incisions on the sides nearly parallel, but converging at their extremities, by removing the flaps above and below, and applying all the sutures before returning the womb. VELPEAU and BERARD have performed IRELAND's modified operation, but they also removed a third slip from the front of the *vagina* (*c*).

[It has been a dispute with whom this operation originated. VELPEAU, in his Clinical Lecture just cited, says, that "the first idea of this operation is due to GÉRARDIN who described it in a memoir which he presented to the Société de Médecine de Metz ou de Nancy, which however was never published. He proposed to contract the *vagina*, and if necessary even to obliterate it, in women in whom the *catamenia* had ceased. He found many opponents to his ideas, which were rejected." (p. 276.) VELPEAU does not mention in what manner it was proposed to effect the contraction of the *vagina*, neither does GÉRARDIN himself in his letter to the Académie (*d*), in which he says, that "before 1823 he had proved that the pessary might be replaced by and the cure of prolapsed womb radically effected by a surgical operation." It is therefore just possible, though not very probable, that MARSHALL HALL might have been aware of GÉRARDIN's suggestion before he proposed and had his operation performed by HEMMING (*e*) in the autumn of 1831.—J. F. S.

(1) DIEFFENBACH (*f*) made use of the actual cautery for the cure of prolapsed womb; but not being satisfied with it, has laid it aside. LAWRIE of Glasgow, however, mentions (*g*) the case of a girl of eighteen, who had prolapsed womb suddenly produced by carrying a heavy tub; nitrate of silver was freely applied, astringent injections and other remedies used, and strips of the mucous membrane dissected off the sides and back of the *vagina*, but without benefit. He then, having dilated with WEISS's *speculum*, applied the actual cautery on either side of the *vagina*, nearly as high as the womb. The operation was very painful, the external parts became œdematous, she had retention of urine, some pain in the belly, and hysterical symptoms, which readily yielded to mild treatment. She was kept in the recumbent posture for six weeks; and left the hospital nine weeks after the operation, without the least tendency to the renewal of prolapse; but having a circular contraction of the *vagina*, just below the womb. Nine months after, the protrusion recurred, after long standing and unwonted exercise. The actual cautery was again applied, the same symptoms produced, but subsided, after one bleeding, aperients, fomentations, &c. She was kept in bed for nine months; then allowed to get up, wearing a compress in the *perinæum*, and a T-bandage, and was perfectly cured.

KER (*h*) mentions a case of prolapsed womb, which would not yield to the usual means for its return, but was treated effectually with ergot of rye. The woman

(*a*) London Medical Gazette, vol. ix. p. 269. 1830.

(*b*) Dublin Journal, vol. vi. p. 486. 1835.

(*c*) Archives Générales, vol. viii. p. 515, Second Series.—Journal Hebdom., vol. iii. p. 275. 1835.

(*d*) Gazette Medicale, vol. iii. p. 533.

(*e*) London Medical Gazette, 1835, vol. i. p. 266.

(*f*) Medicinische Vereinszeitung, 1836, No. 13.

(*g*) Medical Gazette, vol. xxviii. p. 757. 1841.

(*h*) Efficacy of the *Secale cornutum* in a case of Irreducible Prolapsus Uteri; in London Medical Gazette, vol. xiv. p. 604. 1834.

had had external prolapse for three years, which returned when she lay down; but at last a complete prolapse of the *uterus* took place, which could not be returned. "Sixteen hours after, the *uterus* was considerably enlarged, little if at all, below the size of the fœtal head; indeed, in a condition decidedly œdematous." Attempts at reduction, mild aperients, warm fomentations and injection, all failed; and after having been persisted in for twenty-four hours, it was determined to give the *Secale cornutum* in scruple doses every three hours. After taking the first dose she complained of a great deal of grasping grinding pain in that which was down, very much resembling labour, and these pains increased on each succeeding dose. On examination, a material diminution in the size of the prolapsed womb was found to have occurred, so much so that the *rugæ* of the *vagina* were perfectly manifest, and without any great effort the reduction was effected.]

1280. Bellini (*a*), with a pair of hook forceps, grasps the upper segment of the externally-protruded *vagina*, draws it down, and giving the forceps to an assistant, begins at the outer edge of the vaginal commissure, upon the left side of the swelling, with a flat curved needle armed with two threads, to unround it, and with the thread form a half-circle, in the form of a horse-shoe, or an ∩, and thrusting the thread in and out at intervals of two lines. To prevent injury to the *rectum*, the forefinger of the left hand must be introduced, for the careful direction of the needle, which should be passed no deeper than the walls of the *vagina*, and with every stitch only one line of it is to be taken hold of. When the upper part of the swelling is reached, it must be surrounded with four stitches, and the needle carried in the same way downwards, to complete the horse-shoe. The ends of the threads are now to be drawn together, so as to fold up the prolapse, and then fastened with a loop knot. The after-treatment consists in rest, blood-letting, cold fomentation, and diet. After two or three days, the threads may be drawn tighter. A portion of the mucous membrane of the *vagina*, separates after ten days, a scar forms in the *vagina* and prolapse never recurs.

1281. *Episoraphy* is performed, according to Fricke (*b*), in the following manner:—After the patient has been properly placed, the surgeon takes hold of one *labium* with one hand, thrusts in a pointed bistoury about two fingers from the upper commissure, and a full finger's breadth from the edge of the *labium*, and carries it down to the *frænulum*, where he brings it out again in a small curve, so that a portion of the *labium* of a finger's breadth width is separated, and then the upper still attached part of this portion of skin is to be completely cut through in an oblique direction. The same proceeding is to be adopted with the other side, and so carried on to the *frænulum* that a part of the latter is removed, and both cuts brought together at an angle, at a finger's breadth from the *frænulum*. After the bleeding from the spouting arteries has been stopped by torsion, and from the little vessels by cold water, both edges of the wound are to be brought together with from ten to twelve stitches. It should be previously considered whether the prolapse can be kept up merely by quiet position or not; and in the latter case, previous to putting in the stitches, a piece of oiled sponge, upon which a thread is attached, should be introduced into the *vagina*. The patient, after the operation, is to be laid on her side, with the rump somewhat raised, and the knees tied together. Ap-

(*a*) Bulletino delle Scienze Medica. Nov., Dec., 1835.

(*b*) Annalen der chirurg. Abtheilung des Krankenhauses zu Hamburg, vol. ii. p. 142.

plications of cold water or lead wash should be made to the wound, and the urine drawn off by the catheter, for the first few days. Though, however, no perfect union ensue, yet usually the prolapse is partially kept up. The vaginal *mucus* and the menstrual blood escape, and *coitus* can be effected by the opening remaining at the upper part. Should pregnancy ensue, the adhesion may be divided, or cuts on the sides made at the time of delivery (1).

(1) Kock (*a*) uses the quill-stitch in *episioraphy*.

Plath (*b*) gives the account of a birth after *episioraphy*. A bridge still existed; in delivery the lower opening dilated, and was still farther enlarged by three cuts on the sides. The result was completely satisfactory.

[Geddings of Maryland (*c*) has performed successfully the operation of *episioraphy* four times in the following manner. The patient being placed in the ordinary position for lithotomy, and the *prolapsus* reduced, one *labium* was put on the stretch by an assistant, and an incision was commenced, with a common scalpel, about a finger's breadth from the upper commissure, and the same distance from the edge of the *labium*. The incision was carried downwards with a bold sweep, and terminated by a slight curve inwards, and at a little distance behind the *fourchette*. A slip of the *labium*, of a finger's-breadth in thickness, was thus severed from the external parts, taking care not to cut through the mucous membrane of the *vagina*. Making traction on this slip downwards and inwards, the mucous membrane of the lateral portion of the *vagina* was then dissected up to the extent of an inch and a half, and detached with the excised *labium*. The same was repeated on the opposite side, the incision being so directed as to intersect the first cut at an acute angle, and remove the *fourchette* with the other parts. After the slight hæmorrhage had ceased, an oiled sponge was introduced into the *vagina*, and the two raw surfaces brought into apposition by the quilled suture of five stitches. A compress of lint, and a T-bandage were applied, and the parts kept cool with cold water. The sponge which had been introduced to keep up the womb till adhesion had taken place, was generally removed about the fifth or sixth day; and the sutures were taken out, as the parts seemed to have united.]

1282. For the purpose of holding the *labia* together, and thereby preventing prolapse, a hinge ring, about the size of a large ear-ring, should be used; it is to be drawn through the lower part of both *labia* and closed, so that it may lie in the region of the *frænulum* (*d*).

1283. An old prolapse oftentimes cannot be returned without causing anxiety, pain in the belly, costiveness, and other symptoms (*e*). In this case, the womb must be supported with a bandage, and care must be taken for the proper emptying of the bladder and *rectum* (1). If the completely prolapsed womb be so changed by disease, as for example, by *schirrhus*, that its removal is indicated, this must be effected by the ligature (2) or by incision; the latter at least has been done successfully, by Langenbeck (*f*) (3).

[(1) When, in consequence of the altered position of the bladder often attending prolapse of the womb, the urine cannot be voided, and it becomes necessary to introduce a catheter, the altered direction of the *urethra* must not be forgotten; and according to the directions of Cruveilhier, the instrument must be directed downwards and backwards with its concavity downwards, and thus it "first enters the

(*a*) von Graefe und von Walther's Journal, vol. xxv. p. 667.

(*b*) Hamburger Zeitschrift, vol. ii. pt. ii.

(*c*) American Journal of Medical Science, vol. 26, p. 364, 1840; also Braithwaite's Retrospect, vol. iii. p. 151. 1841. Second Edition.

(*d*) Kraus; in Medicinischen Correspondenzblatt des Würtemb. ärztl. Vereines., July, 1843, Nov. 20.—Heyfelder, Das chirurg. und Augenkranken Clinicum der Univers. Erlangen, 1843, p. 45.

(*e*) Richter's Chirurg. Biblioth. vol. iii. p. 141.

(*f*) Neue Biblioth. für die Chirurg. und Ophthalm., vol. i. p. 551.

displaced part of the bladder and is afterwards raised by a lever-like movement into that portion of it still remaining in its natural situation" (*a*).

(2) The removal of a prolapsed schirrous womb was effected with the ligature by Recamier and Marjolin; but the woman died from some cause independent of the operation. Cruveilhier, who mentions this case (*b*), objects to the treatment as being accompanied with great risk of including a portion of the bladder in the ligature. He recommends, in preference, cutting through the back of the *vagina*, into the doubling of *peritoneum* between it and the *rectum*, then drawing the womb through the aperture and detaching it from its cellular connexions with the bladder.

(3) In Langenbeck's operation, the womb, after cutting across the *vagina*, was drawn down, separated from the *peritoneum* without opening its cavity, and cut off, excepting a small portion of its *fundus*, which being healthy, was left undisturbed.]

II.—OF PROLAPSE OF THE WOMB WITH INVERSION.

(*Prolapsus Uteri cum inversione*, Lat.; *Vorfalle der Gebärmutter mit Umstulpung*, Germ.; *Chute et Renversement de la Matrice*, Fr.)

Sabatier, above cited, p. 375.

Fries, C. F., Abhandlung von der Umkehrung oder eigentlichen, in version der Gebärmutter. Münster, 1804.

Herzog, E. B., Dissert. de inversione uteri. Wirceb., 1817.

Newnham, W., An Essay on the Symptoms, Causes, and Treatment of Inversio Uteri; with a history of a successful extirpation of that organ during the chronic stage of the disease. London, 1818.

Crosse, John Green, An Essay, literary and practial, on Inversio Uteri; in Trans. of the Prov. Med. and Surg. Assoc., New Series, vol. i. p. 285. 1845. 8vo.

1284. Under the term *Prolapse of the Womb with Inversion* is understood the dropping down of the *fundus* of the womb into its cavity, and the sinking down of the *fundus* and body into the mouth of the womb, into the *vagina*, and even its protrusion at the external generative parts. It is, therefore, distinguished as *incomplete* and *complete inversion;* in the former case the *fundus* of the womb protrudes more or less through its mouth, and forms a semicircular swelling, which is encompassed by the mouth of the womb; in the latter the whole womb is protruded, from its *fundus* to its neck, through its mouth, and lies in front of the external generative parts in shape of a pear-formed swelling.

[Crosse observes:—"Inversion of the *uterus* is either partial or total; the latter can exist only in one degree, and admits of no subdivisions. Partial inversion, on the contrary, comprises very many degrees; and there are both physiological and practical reasons for noticing and describing three, by way of classification; namely, *depression*, *introversion*, and *perversion*.

Depression, the first division and slightest degree of partial inversion, is present, when any portion of the entire thickness of the walls of the *uterus* becomes convex towards its cavity or interior, without going to the extent of being invaginated, or brought within the grasp of the rest of the *uterus*, supposing it to contract by the action of its muscular coats. The interior convexity is answered by a concavity of the same extent on the exterior surface of the womb. The posterior, lateral, or even perhaps the anterior part of the body of the organ, may be thus displaced after parturition; but usually the *fundus* is the part affected. * * * The palpable evidence of this degree of inversion is obtained by examination through the *parietes* of the *abdomen*, or by the hand *in utero* meeting with a convexity of more or less firmness according to the atonic or contracted state of the part, and giving the idea of a *placenta* still remaining, after the entire *placenta* has been removed. If the *placenta* be

(*a*) Livr. xxvi. p. 2. (*b*) Livr. xvi. p. 4.

still adherent, its attachment is to the inverted portion, and any attempt to remove it by traction will increase the inversion.

Introversion is when so great a part of the *fundus* is displaced, as that it comes within the grasp of the portion of the *uterus*, into which it is received. The greatest degree of this displacement consists in the *fundus* and continuous part of the body of the *uterus* being received into the remainder of its body and *cervix*, the convexity of the *fundus* being palpable at the *os tincæ*. The inverted portion is in a situation to be resisted, supported, compressed, and otherwise acted upon, by the uninverted, by which it is always surrounded. In proportion to the degree of introversion is the depth and extent of the peritoneal pouch opening towards the *abdomen*. The uterine ligaments are in part drawn into this pouch, and the *ovaria* approximate, the marginal circle corresponding to the angle of inflexion. On examining above the *pubes*, the circular margin of the *uterus* can be felt forming the boundary of the inversion, and the *uterus* and part of the body of the organ are wanting; in a thin patient, and where the abdominal *parietes* are relaxed and yielding, the fingers of the accoucheur may even enter the orifice of the peritoneal pouch, pressing those *parietes* before them. If the *placenta* be still attached, it is felt at the *os tincæ*, or in the cavity of the *uterus*, and judged to be of unusual size; if partially detached it allows of great hæmorrhage, which may cease on its removal, if the inverted *fundus* contract, and be felt firm to the touch; but hæmorrhage continues if the inverted mass be soft, indicating that it is still in a state of *inertia*.

Perversion is when more or less of the inverted portion of the *uterus* projects through the *os tincæ*; in its greatest degree the whole body of the *uterus* as well as the *fundus*, passes inverted through the *os*, the *cervix* only remaining *in situ*, encircling the contiguous or highest part of the inverted portion, all the rest being uncompressed and unsupported by the *uterus*. The peritoneal pouch is lengthened, and the proper uterine cavity nearly obliterated. Where "the inverted part is surrounded by the *cervix*, it may constrict it, producing congestion and even strangulation in all the rest of the inverted organ below. The angle of inflexion (so first named by Radford of Manchester) is always below the middle of the body of the *uterus*.

In considering the successive steps of the inverting process, we trace the descent of the *fundus* through the uterine cavity until it projects at the *os*, fills the *vagina*, and reaches the external *labia*; and the process may go on in the same direction to its completion, the inverted *fundus* and even body of the *uterus* prolapsing externally, until the encircling *cervix* descends, under expulsive efforts, to a level with the *labia*, and becomes apparent under ocular examination. But if the *labia* resist sufficiently the farther descent of the *fundus*, and part of the body of the *uterus* remains still uninverted, may not the process be carried to its completion by ascent of the *cervix*? No author has hinted at this view of the subject, and yet its correctness must be admitted, in order to explain the well-established fact, that where the inverted *fundus* and body of the *uterus* are still in the *vagina*, the *cervix* is felt high above the *pubes*, even near to the navel, sometimes taking the situation the *fundus* would normally occupy, the *vagina* being proportionally stretched and carried upwards,—changes which can only be explained by supposing that, at a certain stage, the inversion ceased to progress by descent of the *fundus*, and was continued and completed by ascent of the *cervix*. If the *placenta* be still adhering, it precedes the *fundus*, is felt in the *vagina*, or observed at the external *labia*, giving the attendant an impression of its being firmer than usual, and of greater size. * * * If the *placenta* be already away, a convex tumour occupies the *vagina*, of a greater or less size, according to the proportion of the body of the organ inverted, having a soft, slightly nodulated surface, bleeding easily under the touch, its highest part encircled by the *cervix*. If the *cervix* only remain uninverted, the *fundus* and body of the *uterus* may be so large as to fill the bony *pelvis*, distend the *vagina* and render it difficult, if not impracticable for the accoucheur to reach the *cervix*; but as often as the inverted mass prolapses at the *vulva*, the encircling *cervix* can be felt. * * * Examination above the *pubes* may enable the accoucheur to detect the orifice leading to the peritoneal pouch, formed by the inverted *fundus* and body of the *uterus*, or in the case of external prolapse at the *vulva*, to convince himself of the absence of the organ from the abdomen. (pp. 283–99.)

"In all degrees of inversion," says Crosse, "there is a concavity or pouch lined with *peritoneum*, and open toward the general peritoneal cavity. In simple depres-

sion the intestines rest in the concavity; and as the pouch or *cul-de-sac* increases, the intestines may, if the opening into it be large, occupy this pouch, so that in total inversion, with prolapse, they may actually descend beyond the external *labia*, still resting in the peritoneal bag, which the inversion has occasioned." (p. 308.)]

1285. The inversion of the womb occurs either suddenly, or gradually; the former is possible only during delivery, when it quickly follows if the woman be in the upright posture, and strain very violently at the moment when the child is forced out; or it may occur from pulling at the navel-string, from too short or coiled up navel-string, and so much the more as the *pelvis* is wide (1). The inversion may be produced gradually by polypous growths at the *fundus* of the womb (2), by a slight inbending of the *fundus*, which remains after previous delivery, and gradually increases; in which case there is generally only imperfect inversion (3).

(1) According to Hachmann, (*a*), there may be spontaneous inversion dependent on spasm, probably from deficient contraction of the womb, analogous to partial contraction, which is observed in stricture of the womb, in which case, for instance, the relaxed and toneless *fundus*, sinks inwards, is grasped by the contracting body, and descends completely down to the mouth of the womb.

[(2) On this point Clarke observes:—"It is said that inversion may be produced by the weight of a *polypus* attached to the *fundus* of the *uterus*. This cause may, of course, render unmarried women the subjects of this disease; but it will be rarely met with, first, because *polypus* itself is infrequent; secondly, because the *polypus* must be very large and heavy, that it may have the power of drawing down the *uterus;* thirdly, because an unimpregnated *uterus* is unyielding and firm; and fourthly, because the *polypus*, to produce that effect, must be attached to the *fundus* of the *uterus*." (p. 150).

Crosse, however, says:—"Next to pregnancy, the most frequent cause of enlargement of the *uterus* is a polypous tumour, which, when attached, as often happens, to the internal *fundus* of the organ, may occasion its inversion in all the different degrees that have been referred to. Any of the various tumours that progress towards the uterine cavity, and take the polypoid form, may induce inversion; but the vesicular *polypus*, being softer and of less density than others, and having usually a narrow neck, is less likely, in the progress of its growth and of its expulsion, to cause uterine inversion, whilst the *polypus* of great density, and with a broad basis, and particularly the fibrous, is not unfrequently followed in its later stages by the displacement in question." (p. 321). Inversion of the womb from *polypus* is as various as from any other cause. "At first so partial," says Crosse, "that the *polypus* is still situated in the *uterus*, and next it descends into the *vagina*, bringing the inverted *fundus* to the *os;* then the *polypus* protrudes at the *labia*, the displacement being carried to the greatest degree of partial inversion, and filling the *vagina*, whilst the *cervix* alone continues *in situ*, or is itself inverted with part of the *vagina*. A farther stage remains, in which the uterine inversion is total, and prolapses externally, bringing with it the *vagina*, also inverted. (p. 331). If the *polypus* be attached to any part of the *fundus*, at the terminating opening of either of the Fallopian tubes, or in the interspace between those openings, it may determine a partial and limited inversion, whilst still remaining wholly or chiefly within the *uterus*. The symptoms are the same as a *polypus* produces, without inversion, and cannot be considered characteristic, although generally more severe, such as uneasiness in the uterine region, forcing pains, *leucorrhœa*, and *menorrhagia*." (p. 324).

(3) "In addition to what has been already stated, we may," says Crosse, "enumerate coagulated blood accumulated in the *uterus*, and an hydatidous growth, or mole, occupying its cavity, each of which has been known to cause uterine inversion." (p. 338). Of the majority of the cases referred to the former cause, Crosse has considerable doubt. "Some," he says, "are unsatisfactory, others evidently

(*a*) Einige Falle von krankhafter Lage-veränderung des Utérus; in Hamb. Maga-zin der Ausländ Literatur. Nov., Dec., 1834, p. 352.

stated in error, the epoch of the inversion having manifested itself to the unsuspecting or uninstructed observer, (perhaps some seven or ten days after delivery,) not being the commencement of the displacement, which was coincident with the termination of the labour. With more correctness may we regard distention of the *uterus* from blood as a cause of the *relapse* of inversion." (p. 339). As to the cases uncomplicated with pregnancy, "where blood was the primary cause of enlargement of the uterine cavity," he says, "I cannot quote any so objectionable as the case related by Mr. Watkinson (*a*), in which a woman of fifty years of age had inversion take place under protracted and very severe *menorrhagia*, in which, as Watkinson supposed, in a relaxed state of the *os uteri*, and perhaps of the *uterus* itself, owing to protracted hæmorrhage, the organ became inverted on the expulsion of *coagula*. At the expiration of four or five years the inverted womb hung half way down towards the knees, with a neck formed by the inverted *vagina*, about the size of one's wrist. The patient was reduced to imminent danger of life by sloughing and abscess, when the *uterus* was removed by incision below a ligature placed on the *vagina* with a fatal result. Of inversion following the expulsion of hydatidous masses, he mentions the case recited by Dr. Thatcher, of Edinburgh, in his lectures, in which the woman acknowledged that she had pulled away a protruding mass, which consisted of an immense accumulation of hydatids, firmly cemented by nearly cartilaginous bands, and had thus produced the same result as from injudiciously pulling the umbilical cord for the extraction of the *placenta* after delivery. There was "every diagnostic mark of the inverted *uterus*, with the *os uteri* clear and defined, surrounding its upper base." Attempts to return it were fruitless, and "at midnight the *uterus* was close down on the *os externum*. Next morning it was found fully protruded at the *vulva*, in shape and size like the largest caoutchouc bottle for injection." It could not be returned, and therefore, on the third day "a ligature of silver wire was applied close to the *os uteri*, with the double *canula* as for *polypous*. The ordinary means for supporting strength and preserving cleanliness were used. On the third day from the application of the ligature separation was nearly effected, and the slightly remanent portion was divided with the scalpel." (pp. 340–42.)]

1286. The quick-formed inversion of the womb is commonly accompanied with severe pain, bleeding, inflammation, and swelling of the prolapsed part, and if it be complete, with sickness, fainting (1), convulsions, depressed powers, small and scarcely distinguishable pulse, and with danger of mortification and death; in a complete inversion, however, all the symptoms may be absent (Hachmann). The slowly forming inversion of the womb prevents the discharge of the urine and stools, causes irregular menstruation, bleeding, inflammation of the womb and neighbouring parts, pain in the belly, hæmorrhoidal inconveniences, whites, hardening, excoriation and ulcers of the womb (2), bad nourishment, dropsical swellings, hectic fever, and so on.

[(1) Upon these symptoms Dailliez (*b*) makes the following interesting observation:—"A loop of intestine may follow the *fundus* of the womb, insinuate itself into the cavity, of which the entrance is at first very large, become strangulated, as has been observed after bursting of the womb, and give rise to new symptoms, which have hitherto been merely regarded as sympathetic. The intestinal pains, the swelling of the belly, the sickness, vomitings, hiccough, so frequently attributed to reversion of the womb, may actually depend in some women only on this strangulation." (p. 80).

(2) "Whilst the inverted *uterus* remains in the *vagina*, the discharge (excepting at the periods of menstruation) will be of a mucous kind," observes Clarke; "but if the *uterus* falls lower, so as to protrude beyond the external parts, the exposure of that surface, which, in a natural state, lined the cavity, to air, as well as to occasional injuries, may induce inflammation and ulceration over a part, or the whole of its surface; and the mucous discharge may be changed to one of a purulent kind, so considerable in quantity as to debilitate the constitution, and to cause all the common,

(*a*) London Medical and Physical Journal, vol. vii. p. 435. (*b*) Thèse.

symptoms of weakness. If there are any ulcerations upon the surface of the upper part of the tumour, formed by the inversion of the *vagina*, they will be circumscribed, and rarely cover its whole surface." (p. 155.)]

1287. Inversion is distinguished from prolapse of the womb by the pear-shaped swelling, broad below, on which no opening is found (*par.* 1269). The distinction from a polyp of the womb is always difficult, and depends on the following circumstances; in the complete inversion, the form of the swelling resembles indeed that of the polyp, but it is enclosed at the upper part by a fold, and neither the finger nor a probe can be passed up between the swelling and this fold, as it can in polyp; the completely inverted womb has also at its upper part, from being hollow, a soft and yielding character. But this distinction is especially difficult in an incomplete and slowly produced inversion. When the inverted womb still lies in the *vagina*, it is broader above than below, but the polyp has the directly contrary form; the swelling of the prolapsed womb has a more definite feel than the polyp, which last is more moveable and its surface smoother than that of the prolapsed womb. The simple inbending of the womb may in some degree be felt through the skin of the belly. The *diagnosis* is considerably assisted by the origin of the ailment after previous delivery. But all these circumstances may, in certain cases, lead to no definite results; for the form of polyps as well as their sensibility and mobility varies; both swellings may present a smooth or uneven surface; the polyp may appear soon after birth; the examination of the belly in stout persons gives no result. It seems to deserve particular attention that the polyp, when it has once penetrated the mouth of the womb, grows remarkably quick.

1288. The first indication, in inverted womb, is to return it to its place as soon as possible because otherwise by the quickly ensuing inflammation and swelling, its replacement is difficult and impossible. If the inversion be incomplete and recent, it is sufficient to thrust up the bottom of the womb gently through its mouth with the fingers of the right or left hand collected in a conical form. If the inversion be complete, if it have continued some hours or days, the *fundus* must be grasped with the whole hand, and whilst gently compressed, should be pushed up in the axis of the *pelvis*. In difficult cases the object may perhaps be attained, if two fingers be passed by the side of the protruded *fundus* of the womb into its mouth, enlarging it and then first returning that part next the mouth and afterwards the bottom of the womb. After the reduction is completed, the hand is to be kept in the womb till, by simultaneous rubbing and sprinkling the belly with cold water, it have perfectly contracted, and the after-birth, if still retained, have been thrown off (1). Quiet in the supine posture with the rump raised, and the avoidance of all exertion, are favourable to keeping the returned womb in place (2). If the replacement be impossible, from the inflammation and swelling, or if on account of the increase of dangerous symptoms, especially of convulsions, it cannot be undertaken, then, after the womb has been gently thrust into the *vagina*, it must be attempted to diminish the swelling by suitable antiphlogistic treatment, and by simultaneous emptying of the bladder and *rectum*, before proceeding to its return (3). Attempts at replacement must not be continued too long, nor too violently, because thereby the most dangerous symptoms arise; but should be re-

peated after a suitable pause. In one such case the womb has been seen to return by the ensuing contraction (*a*).

(1) If the *placenta* remain still attached to the prolapsed womb, its separation must be first effected, before any attempt at replacement, because the reduction together with that of the *placenta* is considered impossible; but as this is contradicted by experience, the removal of the *placenta* renders the reduction doubtful, and dangerous bleeding may be easily produced; so the greater number of modern accoucheurs agree to attempt its reduction, together with that of the *placenta*, and only to remove it when it adheres very slightly.

(2) In chronic inversion, it becomes more difficult to preserve the womb in its place, because it has lost its power of contractility. To effect this, some have recommended the introduction of pessaries, (Rousset,) of several pieces of sponge, (Jörg,) of a caoutchoue bottle, (Fries,) and of peculiar supports for the womb, (Löeffler, Siebold).

["In a case where the *uterus* has been long inverted, and lies in the *vagina*, (the latter cavity having undergone no change, except from distention,) it will not be advisable," says Clarke, "to recommend any other remedy than the injection of some very mild astringent fluid three or four times a day, into the *vagina*. Some restraint will thus be placed upon the quantity of the discharge, and the parts will be kept clean by it. Pessaries are useless; the *vagina* being already so completely filled that nothing more can be retained in it." (p. 156).

(3) In the treatment of recent inversion, Clarke lays down, that "the *uterus* is to be first returned to its usual state and natural situation; and the case then becoming simply one of a retained *placenta* is to be treated as such; but if, neglecting this order of proceeding, the *placenta* should be first removed, a number of bleeding vessels will be exposed before the *uterus* can contract, so as to restrain the hæmorrhage; and the chance is, that the patient may die from its effects." (p. 152).

Inversion of the womb "is occasionally met with in the chronic state," says Clarke, attended by a mucous discharge. The symptoms of the chronic state resemble those of *procidentia uteri;* and, an examination being made, a tumour is found either in the *vagina* or hanging out of the external parts. Such a tumour may be mistaken for *polypus;* but in the latter disease, the *os uteri* encircles the tumour; in inversion of the *uterus*, the *os uteri* forms a part of the tumour itself. Moreover, the inverted *uterus* is sensible; *polypi* of the *uterus*, on the contrary, are void of feeling." (p. 153.)]

1289. If the return of an inverted womb be impossible, dangerous symptoms must be prevented by properly emptying the bladder and *rectum* by the avoidance of all effort and so on, and by the introduction of a pessary to prevent, if possible, the farther descent of the womb. But if the inversion be accompanied with threatening symptoms, if the replacement be in nowise possible, if the womb be in a state of cancerous or other kind of degeneration, then may the cases related (*b*) of successful removal of the womb, determine us to its removal with the knife, after previously applying a ligature; or with the ligature, in which it is best to apply two ligatures with a single needle and to tie them on each

(*a*) Saxtorph's gesammelte Schriften geburtshülflichen Inhaltes; translated into German by Scheel. Copenhagen, 1803, p. 305

(*b*) Berengarii Carpi, Comment. ad Mundini Anatom., p. 225.—Dietrich, C. M., Rede von einem Vorfalle und glücklich unternommener Absetzung der Mutter. Nürnb., 1745. 4to.—Faivre; in Journal de Médecine, vol. iv.—Wrisberg, Commentatio de Uteri mox post partum naturalem resectione non lethali. Götting. 1787.—Richter's chirurg. Bibliothek., vol. viii. p. 671.—Newnham, above cited.—Windsor, J., Some Observations on Inversions of the Uterus, with a case of successful extirpation of that organ; in Med.-Chir. Trans., vol. x. p. 358.—von Siebold's Journal für Geburtshülfe, u. s. w., vol. v. pt. ii. p. 406.—Böttger, in von Graefe und Walther's Journal, vol. xxiii. pt. ii.—Kettler, in Oester. Medicinischen Jahrbüchern, vol. xi. pt. iii.—Cook, J. C., Case of Loss of the Uterus and its appendages soon after delivery; with remarks on the propriety of removing that organ in cases of Inversion or Scirrhus. London, 1836.

side to prevent slipping; it must, however, be borne in mind that the intestines may have descended in the place of the inverted womb.

[When the inverted womb falls out of the body, drawing with it the *vagina*, and increasing weakness is produced by the quantity of the discharge, "if this case is left to itself, the woman," observes CLARKE, "either drags on a miserable existence for a number of years, or her life is cut short by the constant drain. Cases of this kind can receive very little benefit from external applications; and it is obvious that not much is to be expected from internal medicines. Powdered chalk or *lapis calaminaris*, sprinkled upon the part, may check the discharge a little; the oxide of zinc may in some measure abate its quantity; but it will not remove it altogether; and the same observation will apply to astringent applications generally. The following application may have a beneficial effect:—℞ *liq. calcis* ʒiv. *mucil. sem. cydon.* ʒvj. M. * * * It may be considered more prudent, if the discharge diminishes in consequence of such applications, to persevere with them, rather than to risk any danger which may arise from an operation. In those cases of inversion of the *uterus*, where the woman has passed the menstruating age, where her comfort is destroyed by the disease, and where the profuseness of the discharge threatens her with death from the debility which it produces, it may be advisable to recommend the performance of an operation, which has been in many instances attended with success, and from which the author has known a patient recover after she has attained the age of sixty; this operation is the removal of the inverted *uterus* itself. Although it is not expedient to subject a patient labouring under a chronic inversion of the *uterus* during the menstruating portion of her life, under ordinary circumstances, to the danger of the removal of the organ, the system of a woman may be so drained by the excessive discharge as to warrant the performance of the operation." (pp. 157, 58).

It does not appear that the removal of the inverted womb by ligature is dangerous; the cases treated by CLARKE himself, as well as those he quotes, did well; so also BLUNDELL's case, and he observes:—"Indeed I have not heard even of any cases in which the operation has been followed by fatal consequences; though such cases must, I presume, occasionally occur." (p. 145). In one of CLARKE's cases, "a strong silken ligature was used, and although nearly three weeks elapsed before the *uterus* was separated during which symptoms of inflammatory action presented themselves in full force, with vomiting and *diarrhœa*, the result was most successful, and perfect health was restored. (p. 159). In another, in which the operation was performed by CHEVALIER, "a ligature was applied round the contracted part of the tumour, that is, where the *uterus* terminated, and the *vagina* began. It was tightened daily, until about the eleventh or twelfth day, when the parts included in the ligature were absorbed, and the *uterus* fell off. During this time the patient complained of very little pain." (p. 163). BLUNDELL "applied the ligature with HUNTER's needle, as in the case of *polypus*, and in eleven days the *uterus* came away; it sloughed, and softened down, so as not to separate bodily, in the form of *uterus*, and the recovery of the patient was complete." (p. 144). In Dr. JOSEPH CLARKE's case (*a*), "the pressure by ligature, which the partially inverted *uterus* bore for many days, not only with impunity, but with decided benefit to the future health, constitutes the leading feature of this case. When the *uterus* became completely inverted, its amputation became an easy operation, and the patient's previous good health suffered no diminution." (p. 161).

Dr. SYMONDS of Oxford (*b*) applied a ligature in a case of inverted womb in a young woman, eighteen years of age, two years and a half after the delivery of a living child. The *placenta* had been long retained, and was brought away with great violence. The ligature was tightened every other day, and the patient did not suffer much pain till this had been several times repeated. The tumour separated on the fifteenth day; three or four days after, dangerous symptoms appeared; and on the sixth day after, she died. On *examination*, about a quart of pus was found in the *peritoneal* cavity; the bladder and *omentum* were adherent; and there was a free and open passage between the *vagina* and the abdominal cavity; of a circular form, capable of admitting the finger, and consisting of the ring of the *os*

(*a*) Edinburgh Medical Annals, vol. ii. p. 419, and also quoted as above by CLARKE.

(*b*) North of England Medical and Surgical Journal, vol. i. p. 149.

uteri, and about three lines of the *cervix*, close upon it were the ovaries, of natural appearance, and the remains of the Fallopian tubes.

III.—PROLAPSE OF THE VAGINA.

(*Prolapsus Vaginæ*, Lat.; *Vorfall der Muterscheide*, Germ.; *Chute du Vagin*, Fr.)

Schrager, Dissert. de prolapsu vaginæ uteri. Lips. 1725.
Strochlin, J. G., Dissert. de relaxatione vaginæ, prolapsu et inversione uteri. Argent., 1749.
Sabatier, above cited, p. 390.
Loder, J. C., Prog. i.–iii. de vaginæ uteri procidentiâ. Jen., 1781.
Meisner, above cited, p. 212.
Clarke, Charles, above cited, part i. p. 142.

1290. When the canal of skin which forms the *vagina* protrudes wholly or entirely from the *labia*, it is called *Prolapse of the Vagina*. It may consist either of the internal membrane alone, or of all the membranes of this canal; in the former case only is it possible for the womb not to descend at the same time. The prolapse is either *complete* or *incomplete;* in the former, the whole of the *vagina* descends; in the latter, only a part at one or other side, and usually on the front.

[The prolapse which Chelius treats of more especially, must be considered as the *anterior prolapse* of the *vagina*, and differs decidedly from the form described by Clarke, who says, "the term *procidentia vaginæ* is here meant to imply a relaxation of the posterior part of the *vagina*, so that this part is lower than the natural defined edge of the *perinæum*." (p. 142). From this description, it may be fairly distinguished as the *posterior prolapse* of the *vagina*.

John Burns (*a*) says, that "the *rectum*, in every degree, is more or less drawn down, and brought forward, sometimes so much so as to form a kind of pouch in the protruded *vagina*." (p. 78.)]

1291. The *Complete Prolapse* is at first characterized by a soft bluish red, slightly wrinkled or smooth ring which, by its gradual lengthening, acquires a cylindrical form, and, at its lower end, has an aperture into which the finger may be introduced, and the mouth of the womb felt. The prolapse is increased by standing, and generally returns in the horizontal posture. If it have existed for some time, the condition of the skin is changed, it becomes dry, and similar to the common tegument; it may inflame, pass on to ulceration, and so on. Inconveniences are connected with prolapse of the *vagina* similar to those accompanying prolapse of the womb, only in a slighter degree; the patient feels, especially if the prolapse have occurred suddenly, a pressure in the *vagina*, a constant disposition to void the urine and stools; she is subject to a copious flow of whites, the menstruation becomes irregular, and on every violent exertion prolapse of the womb is to be feared. *Imperfect Prolapse* forms a blind sac, at the under end of which there is not any opening, and at the side of which the finger may be passed into the canal of the *vagina*.

The prolapse which depends on vaginal rupture, has been already mentioned (*par.* 1248). The *diagnosis* between prolapse of the *vagina* and that of the womb is easily determined by the symptoms mentioned, by the excrescences in the *vagina*, and by examination.

(*a*) Principles of Midwifery. Ninth Edition.

["Very few symptoms attend this complaint," says CLARKE; "some pain in the back is present, but this is not considerable; some transparent *mucus* comes away from the *vagina*, and the woman complains of a relaxation in the parts, and of something projecting from them." (p. 145). "In the earlier stage," BLUNDELL (*a*) observes, "the tumour is very small, perhaps not larger than the ball of the apex of the fore-finger, forming at the back or front of the *vagina*, or laterally, or in all three positions at once, protrusion by no means uncommon. These protrusions, if small in size, may be looked upon as natural to the part; but they often show a disposition to increase, and then begin to attract attention." (p. 29.)]

1292. The following circumstances predispose to prolapse of the *vagina;* relaxation, and slight cohesion of the *vagina*, and its surrounding cellular tissue in cachectic subjects after a violent flow of whites, after frequent deliveries, especially if the *perinæum* be torn, after too frequent *coitus*, onanism, and the like. The occasional causes are, violent exertions in lifting heavy weights, in violent vomiting, shrieking, and the like; violent efforts in delivery, especially in improper postures, in going to stool and so on; also pressure from the parts surrounding the *vagina*, for instance, from large stones in the urinary bladder, from retention of urine, dropsy of the belly, and so on, may produce prolapse. It arises in general suddenly or slowly.

[CLARKE's form of prolapsed *vagina* is considered by him to arise from the habitual constipation of the bowels, to which women subject themselves, in consequence of which "the lower part of the intestinal canal becomes so distended sometimes as to make the posterior part of the *vagina* approach near to the anterior part of the *pelvis*, and in this way the diameter of the *vagina* may be much diminished. This extreme distention of the gut at length diminishes, or takes off the power of contraction upon its contents, and the strength of the *sphincter* muscle is increased by its frequent resistance to the contraction of the intestines and abdominal muscles; at length, when, by the operation of purgative medicine, or by the natural strong efforts of the intestines, or by manual assistance, (which is sometimes required,) the lower bowel is emptied of its contents, the pouch formed by it, and the posterior part of the *vagina* continues, so as to form *procidentia vaginæ*. If the fore-finger of the surgeon is passed into the *anus*, under such circumstances, and carried forwards, it will be directed into the pouch so formed. This disease appears sometimes to be produced by piles, acting in the same manner as habitual costiveness. * * * The complaint may also be produced by cysts belonging to diseased ovaries, falling down into the hollow between the *rectum* and the posterior part of the *vagina*. In one case where this happened in labour, it was only "terminated by opening the child's head, by means of which operation the life of the woman was saved. After the labour, the cyst went up again into the cavity of the *abdomen;* and the *vagina* being no longer pressed down, regained its natural situation." (pp. 143, 44.) CLARKE farther observes, that "when the patient is in the horizontal posture, the tumour made by the prolapsed *vagina* is somewhat smaller than when she is erect; but it never goes away altogether. Its size is sometimes as large as a hen's egg. Very few symptoms attend the complaint." (p. 145.)]

1293. A small and recent prolapse of the *vagina* is easily returned if the patient being put in the horizontal posture, on her back, with the rump raised, the protrusion be pressed back with the finger well oiled, and the skin of the *vagina* also pressed every where on the sides. If the replacement be prevented by inflammation and swelling, or the prolapse be of long standing, luke-warm baths, softening applications, a longer continued supine posture, and attention to the free voidance of the urine and stools must be employed.

[For curing the posterior prolapse, CLARKE says:—"The practitioner is to direct proper means to keep the *rectum* empty, and thus to remove one of its causes; afterwards he is to endeavour to restore the tone of the gut. Without attending to the

(*a*) Above cited.

first of these objects, the second cannot be accomplished; and unless the tone of the bowel is restored, the mere emptying of it will be useless. Purgatives given by the mouth, and clysters thrown into the *rectum*, are the means by which the first of these objects is to be attained. If piles are present, the class of resinous purgatives is to be avoided. * * * As in some instances, the gut is so much distended as entirely to have lost its power of action; neither clysters nor purgatives will be of any avail; the clyster-pipe, as it passes into the *rectum*, will be blocked up by *fæces;* and purgatives will only bring a large quantity of *fæces* down, which will add to the bulk, already too great. Nothing remains in this case but to empty the *rectum* by manual operation. * * * The patient being placed on her left side on a bed, her knees being drawn upwards, the fore-finger of the right hand of the surgeon, covered with oil, is to be introduced into the *vagina;* a marrow-spoon, or the small end of a common table-spoon, covered with oil, and warmed, is then to be introduced into the *rectum;* and by means of it, assisted by the finger in the *vagina*, the *fæces* are to be scooped away. A large clyster is then to be thrown up; and if any fæculent matter should be lying in the sigmoid flexure of the *colon*, it will be brought down into the *rectum*, where it may be easily removed. For the purpose of giving tone to the *rectum*, the same means are to be employed as are calculated to produce similar effects in other parts of the body. Bandages are not applicable to this case. The object is to give support to the posterior part of the *vagina* and to the weakened *rectum*. A globular pessary answers both of these purposes very well, and it should be carefully adapted to the size of the *vagina*. * * * Costiveness in future is to be carefully prevented." (pp. 146–48.)]

1294. To prevent the reprolapse of the *vagina*, the introduction of pads filled with astringent substances, and steeped in red wine, or sponges cut in conical form, moistened with astringent fluids, should be used previous to employing the pessary. The patient must for a long time observe rest and a horizontal posture; and employ the remedies advised (*par.* 1275) for strengthening the relaxed parts. In old prolapses, which cannot in any way be kept up, the operation already mentioned in prolapse of the womb, (*par.* 1278,) by narrowing or closing the *vagina*, can alone get rid of the evil.

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*III.—OF PROLAPSE OF THE BLADDER.

(*Prolapsus Vesicæ*, Lat.; *Harnblasenvorfall*, Germ.; *Chute de la Vessie*, Fr.)

Clarke, C. M., above cited, part. i. p. 130.
Blundell James, M.D., above cited, p. 31.

[*Prolapse of the Bladder* may be easily mistaken for prolapse of the *vagina*, and has been confused, though with less cause, with that of the womb, although some of the symptoms are common to both. The prolapsed bladder falls back, just behind its neck, carrying with it, into the cavity of the *vagina*, the front of that passage, and the two together descend less or more completely, and appear at the *os externum* in form of a convex or hemispherical swelling, which fills up the orifice, and sometimes protrudes between the *labia*, the transverse folds of the *vagina* being less or more distinct upon it, according as the bladder is full or empty.

The sensation of bearing down is less great than in prolapsed womb; but it is in some women greatest in the horizontal posture; in the night, therefore, the patient is much annoyed with this sensation, which is frequently accompanied with a perpetual desire to make water. The discomfort and protrusion is greatest when the bladder is full; but it rarely

happens that that organ can be completely emptied, the muscular fibres forming the pouch or tumour not appearing to have the power of contracting completely. The peculiar symptom of prolapse of the bladder is a pain referred to the navel, with a sense of tightness there; the pain greatest when the bladder contains the largest quantity of urine, diminishing as the water is voided, and ceasing when the bladder is nearly or entirely emptied. This symptom is especially noted by CLARKE, who thinks it may be accounted for, perhaps, by a stretched state of the umbilical ligament, (the remains of the umbilical arteries,) or by the dragging upon the navel itself. The pressure of the back of the bladder on the front of the *vagina* lengthens the cellular tissue, connecting it with the front of the *cervix uteri;* but, as it does not yield readily, it drags down with it the anterior lip of the *os uteri*, and lengthens it very much. Hence, "the *os uteri*," says CLARKE, "instead of being found in the centre of the *pelvis*, opens directly backwards, and lies in contact with he posterior part of the *vagina;* so that the space between the elongated anterior lip of the *os uteri*, and the posterior part of the *vagina* is very small;" and sometimes, indeed, the *os* is patulous. There is often a discharge of *mucus* in these cases, and rarely it is profuse.

Prolapse of the bladder is distinguished from prolapsed womb, by the absence of the stomach symptoms, which rarely, if ever, occur when there is mere displacement of the bladder (CLARKE). There is not any aperture in the protruded part, as in prolapsed womb; but the swelling has a regular form, filling up more or less completely the cavity of the *vagina*, but admitting the finger to be passed up between itself and the hind wall of that passage, to the mouth of the womb. CLARKE says that, on tracing the tumour in the *vagina* "to its origin, it may be felt lying between the *os pubis* before, and the *uterus* behind; and a practitioner can hardly fail to discover that it is formed by fluid." The latter part of this observation is correct; but its relative condition with regard to the womb will depend upon the extent of the dropping down of the bladder, and the position of the womb is rather above than behind the tumour. The diminution of the size of the swelling when the bladder is emptied, is also another characteristic, and distinguishes the disease from the encysted or other tumours which occasionally, though rarely, form in the neighbourhood of these parts.

If the catheter be introduced, it can be easily felt within the cavity of the swelling, (an excellent indication of the disease,) and, under voluntary urging, the swelling is found to increase considerably in size. By these two marks the disease may be readily known (BLUNDELL). If the prolapse occur during labour, care must be taken not to mistake it for the descending portion of the membranes, by which irreparable mischief has been inflicted (CASTLE).

The *treatment* consists in keeping the bladder constantly empty, in the injection of astringents, and in wearing a pessary, either globular, or egg-shaped. The latter is, perhaps, the most preferable, "particularly," says CLARKE, "where the diameter of the *vagina* is but little increased by relaxation." All exertion which might force the bowels down upon the bladder should be avoided, and the patient should be kept quiet; and, perhaps, if confined to the recumbent posture upon

her face, with a catheter in her bladder, so that the urine might pass off without being retained in the bladder, and thus the disposition of that organ to contract encouraged and kept up till the *vagina* had recovered sufficient tone to resist the pressure of the protruding bladder.

The use of the pessary and astringents is said to be generally sufficient for the cure of prolapse of the bladder; but sometimes the instrument cannot be borne, and the downward pressure of the swelling is so great and inconvenient, that the woman is incapable of any exertion, or even of moving about without much distress. Under such circumstances, it will be advisable to take out a portion of the front wall of the *vagina*, and thus diminish its disposition to yield to the pressure of the bladder.

Cases of prolapse of the bladder do not often fall under the surgeon's care, in this country, except when the ordinary treatment with pessaries and injections fail, and it becomes a question whether the patient can be relieved by an operation. One such instance has come under my care, and been considerably relieved; for, although not entirely cured, the patient has been enabled to resume her ordinary occupation.

Case.—M. A., aged twenty-five years, a fair-haired, hysterical, well-formed, but not stout single woman, came under my care,

Oct. 24, 1837.—She began to menstruate when sixteen years old, and for the first year had good health; but since that period has been continually ailing, and suffered very much at her monthly times. The menstrual discharge has been scanty, and not lasting more than two days, when she has been so unwell as to be quiet; but, when engaged in her occupation as housemaid, and able to be about, it has been plentiful, and lasted four days. She has always had much bearing down, and, within the last three or four years, has suffered much from *leucorrhœa*, and the bearing down has so increased, that, for the last twelvemonth, she has been unable to follow her usual employment, and been compelled to give up her place. Five months ago the protrusion was as large as a cowrie-shell, and, when she exerted herself, it became much larger. She did not usually void her urine for twelve or sixteen hours, and then the protrusion disappeared. Micturition was always accompanied with sharp smarting pain; it was long before she could void any water; sometimes not for eighteen or twenty hours. By repeated efforts, however, she was at last enabled to empty her bladder, and never required the introduction of a catheter. Last spring she attempted wearing an Indian-rubber pear-shaped pessary; but it was useless, as, whenever she walked about, it immediately dropped out. For the last three months she has kept in bed, used astringent injections, and worn a sponge pessary, which has kept the swelling up, but without any actual improvement.

Nov. 11.—I made an examination with the view of ascertaining the feasibility of removing some horizontal slips of the front of the *vagina*, as suggested to me by my friend Dr. Locock. As she had not made water for three hours, the bladder was partially filled, and a swelling, about the size of a cowrie, protruded through the *os externum vaginæ*, and just appeared in front of the *furcula*. Some of the *rugæ* of the *vagina* were very distinct, and the swelling began a full inch behind the orifice of the *meatus*, which canal was not at all displaced, and allowed the ready entrance of a catheter into the bladder. Slight pressure returned the tumour, and the *os uteri* was then found depressed to within an inch of the *os externum*. On expanding the *vagina* with the *speculum*, it was seen to be so drawn off from the front of the neck of the womb, that no appearance of neck remained; but from the plane of the *os uteri* to the front wall of the *vagina*, was one continuous and very open curve; but the *cul-de-sac*, behind the neck, was, on the contrary, very deep. Having withdrawn the *speculum*, I could, without difficulty, nip up an inch and a half of the *vagina* from the back of the bladder; and having ascertained this, it was determined to remove a slip or two of the lax part.

Nov. 12.—Having bound her, and put her in a position for lithotomy, as there was but little protrusion, and her efforts failed of driving the swelling down, I commenced the operation by pinching up the front of the *vagina*, and passing a *tenaculum* through, drew it down; I then introduced a needle and ligature, about an inch

below the *os uteri*, and half an inch above the *tenaculum*, for the purpose of drawing down the *vagina* after the removal of the proposed slip, and to prevent difficulty from its retraction. The portion of the *vagina* included on the *tenaculum* was then drawn down, and having been felt to be separated from the bladder, I made a horizontal cut, about an inch and a half in length, carefully separated the *vagina* from the bladder, first with the blade, and after with the handle of the knife, till I could hold the slip with my thumb and finger, and withdrew the *tenaculum*. I then separated the flap till it was an inch in depth at the middle, but tapering to a point at each end, and cut it off horizontally below with a pair of scissors. There was pretty free bleeding, but only one small vessel could be found to tie, and it ceased after sponging with cold water for about a quarter of an hour. I then introduced three platina sutures upon very small needles, the middle one first, and having brought the edges of the wound close, twisted them together. She was then put to bed upon her face, a catheter introduced, and the urine directed to be withdrawn hourly. The operation was not difficult, nor very painful; but there was a little awkwardness in getting the sutures through, perhaps from the small size of the needles.

Nov. 13.—Last evening there had been a little oozing of blood; but during the night a considerable quantity; one sheet having been soaked through, has been removed, a second is in much the same state, and there is about eight ounces of clot in the hair of the *pubes*. She feels rather faint, but her face is much flushed. She has passed plenty of water, both through and by the side of the catheter; but she complains of much pain in the chest and loins, with great tenderness of the belly.

As it did not seem well to permit the continuance of the bleeding, I removed the catheter, cleared away all the clot, and introduced the *speculum*. No clot was found in the *vagina*, but there was a free oozing from between the lips of the wound. Failing to find any vessel, I removed the right suture, upon which the wound gaped, and seizing its upper lip whilst she strained, I drew it down, and carefully examined the whole surface, from which the oozing was very free. After considerable trouble, I found and tied three small bleeding vessels, which, however, I believe to be veins, and the bleeding being checked, I passed a silk suture, and again introduced the catheter.

Nov. 15.—She has not had any more bleeding, and the pain and tenderness of the belly have diminished, but the latter still continues about the region of the bladder. There is a little fetid discharge from the *vagina*, and some small thin flakes of adhesive matter in the urine. On examining with the *speculum*, I found all the sutures had begun to ulcerate, and therefore removed them; the metallic ones with some difficulty, as they did not readily untwist. The wound did not gape, but the extent of the union could not be ascertained. On the front of the *vagina*, near the neck of the womb was a seemingly ulcerated spot, perhaps where the first thread for drawing down had been passed.

She had a tolerably good night, and next morning drew off about half a pint of very ammoniacal urine, with much adhesive flakes; this evacuation was followed with great pain in the bladder and *pudendum*, for about half an hour, and then gradually subsided. In the course of the day, the quantity of water drawn off increased, and became quite clear. She had not any febrile excitement, but still complained of much pain in the left breast, across the pit of the stomach, and over the whole belly, which is probably only hysterical. She had an increase of the throbbing in the wound, which has been constant since the operation.

Nov. 17.—The throbbing has diminished, and the discharge from the *vagina* has increased, and is distinctly purulent. She has still much pain in the region of the bladder, and the urine is much loaded with adhesive matter.

Nov. 19.—Is better, and has passed plenty of urine, which yesterday was scanty, and the sediment in it mucoid. Less throbbing in the *vagina*, but the discharge increased. Complained of pain and soreness, with beating in the umbilical region, and some tenderness on pressure, as also about the region of the bladder; and also pain in the upper part of the thigh. Her bowels are kept regular with castor oil. In the course of the evening she became very hysterical, and it was necessary to give her some æther and tincture of henbane, with camphor mixture. But next day she had recovered herself, and her bowels having been freely moved, the abdominal pain almost entirely ceased.

Nov. 22.—The *speculum* was introduced to examine the state of the parts, but being inefficient was withdrawn, and the *os externum* being held widely apart with

the fingers, she was desired to bear down. This brought the wound into view, which had not yet united, but was healing by granulation. There was a free *leucorrhœa*.

Jan. 6, 1838.—Up to the present time she has been kept in bed, and the wound has healed. The discharge continues very profuse, and she has much pain in the loins. On examination the bladder was found still falling back as previous to the operation.

A fortnight after, she was allowed to get up and walk about; the descent of the bladder soon became as at first, and protruding between the *labia* when she exerted herself. The operation had therefore been unavailing. In the middle of *March*, after going about more than usual, the bladder protruded to the size of an egg, and on the following day still more; but a few days rest in the recumbent posture restored the old condition.

As she continued very delicate, it was determined she should go to the sea-side for the improvement of her constitutional powers, and she went to Brighton in *April*, wearing a globular pessary, which kept the bladder up; but after a month as it caused much pain in the region of the bladder, it was thought advisable to remove it, which was done with much difficulty, and in course of the following week the protrusion returned. For some weeks she used a cold salt water hip-bath daily, and the recumbent posture; and afterwards, sea-bathing three or four times a week, but without diminution of the discharge, and with no benefit to her health.

The *vagina* was then cauterized with the caustic potash thrice, at intervals of a week; from the first application there was little sloughing, the second caused much, and the third less, but more than the first; and during the separation of the sloughs, she used injections of cold sea water continually, and took forty drops of the tincture of muriate of iron twice a day. She left Brighton in *September* without any material improvement and returned home to her usual employment. Soon after, the dragging pain in her loins and the protrusion increased, and if she walked a short distance, these became worse, and were accompanied with pain in the upper part of both thighs. In *December*, a ring pessary was introduced to relieve the protrusion, but its pressure upon the rectum was so great, that she could not pass her motions, and after having been worn three days, it was necessary it should be removed.

She came under my care again in *January*, 1839, much out of health and spirits; nothing therefore was done but to improve these, and I did not make any examination till the middle of *April*. The bladder was then still fallen, but less than before, merely appearing at the *os externum*, and returned with the least pressure with the fingers; the scar on the front of the *vagina*, of which the shortening was very decided, was quite visible, and though not hard was tender; the position of the womb and the state of its lip was nearly the same as at first. Thinking, as little pressure kept the bladder in place, a small oval pessary might be useful, I introduced one; but the next day the bladder had slipped down between it and the *pubes*, and she had so much pain that it was necessary to remove it.

Although kept in the recumbent posture, she still had severe dragging pain in the loins, equally as when she was about; and as she objected to the application of caustic again, but was willing to submit to an operation, I determined on removing a vertical piece of the *vagina*, which was done

May 18.—She was now placed standing with her body bent at right angle with her legs, and resting upon a table, with the *pelvis* rather higher than the shoulders. A pewter *speculum*, slit lengthways and the edges widely opened, was introduced into the *vagina*, with the gap towards its front; a catheter was introduced; the *labia* held apart by assistants, and the *perinæum* pressed up with the *speculum*. I then seized the front of the *vagina* with Beaumont's needle and drew it down till I could conveniently pass a *tenaculum* through it, which done, the needle was withdrawn. Pulling up the *vagina* with the *tenaculum* as far as I could, I cautiously made two simi-ellipticle cuts about an inch and a half in length, from half an inch below the neck of the womb to about the same distance behind the *urethra*. The right cut was made freely with a common scalpel, but the left required a little more care and was made by short portions, cutting upwards with a *phimosis* knife which was very convenient; and the insulated piece was then dissected off the bladder, leaving a gap about half an inch wide, which was increased to an inch by paring the edges of the wound. There was as in the former operation, very free oozing of blood, and it became necessary to tie two small arteries. Three sutures were put in very

readily with BEAUMONT's needle, and the *speculum* having been withdrawn they were tied and the operation completed. She was put to bed on her face, an elastic male catheter introduced, so that the urine might escape as soon as it entered the bladder; and twenty drops of laudanum, thrice a day in mint water, were ordered for the purpose of keeping the bowels costive.

May 23.—Excepting a little discomfort from position, she has been tolerably well. There is now a little purulent discharge, and on gently separating the parts one suture was found separated, but there was little inflammation about the wound.

May 26.—She was rather flushed and feverish, and had not passed water for some hours; the catheter was withdrawn, found to be clogged, and when introduced again, a pint of high-coloured urine passed, which greatly relieved her. Another suture and one of the ligatures came away in the evening, and on the following day the remaining suture and ligature.

June 7.—The catheter having caused some irritation to the bladder, was removed, and a common female instrument given her to pass frequently, so as to prevent distention of the bladder. Up to this time the urine has been more or less turbid, with flakes of adhesive matter, as after the first operation.

June 18.—Having now been on her face for thirty-one days, latterly without much inconvenience, she was allowed to lie on her side.

July 22.—An examination was made; there was less protrusion, but the bladder still falls back into the *vagina*. The wound is perfectly healed; but there is tenderness about the neck of the bladder. The discharge continuing, a small bag partially filled with powdered oak bark was introduced into the *vagina*. The bark swelled so much with the moisture that it was necessary to diminish its quantity.

Aug. 5.—The discharge is materially diminished, but the *vagina* slips below the bag.

Aug. 25.—Was allowed to dress herself, but still kept in the recumbent posture. The bark bags were left off, and a saturated solution of alum in elm bark was ordered to be injected frequently during the day.

Sept. 5.—She has not gained much advantage by the injection; the bladder is just visible at the *furcula*.

Sept. 20.—She returned home, being able to walk about much better than previous to the operation, and had but little pain in the loins; the discharge, however, continued. She was directed to wear a pad in the *perinæum*, supporting it with a T-bandage, and to use the oak-bark bags.

On the whole I was fearful that she had not derived any material benefit by the operations to which she had been subjected, but was agreeably surprised on seeing her in

November, 1840, to learn that soon after her return home, she had been able to stand whole days at the ironing-table without any protrusion. For some months she has been able to go about without difficulty, and do any thing she has to do; but she says there is some protrusion. I examined her, however, and found little or none.

In the following *January* she married, and was confined in the ensuing *December*. She was taken in labour on the 16*th*, and delivered after forty-eight hours. She got up at the week's end, and a week after there was protrusion about the size of a walnut, which continued increasing till at present, *March* 20, 1842.—The bladder again protrudes between the *labia*, about the size of a crown piece; after standing up, the mouth of the womb descends behind; but both easily return when she lies down. Her health is now tolerable, and she manages with a little weariness to get through the usual occupations of a labourer's wife.

As with all the disadvantages which her continual standing whilst at the ironing-board, the protrusion had been materially checked, and she was capable of exertion which for some years before she was incapable of making, it may be inferred that the latter operation was advantageous to her, and that probably had she kept quiet at first for some months, she would have recovered completely. I should not hesitate therefore to perform this operation in a similar case.—J. F. S.

LIGHTFOOT of Newcastle-on-Tyne (*a*) has performed successfully FRICKE's operation of episioraphy in a case of prolapsed bladder which descended through the

(*a*) Lancet, vol. i. p. 322. 1841.

labia to the size of a fist. Six strong hempen sutures were put in; the limbs tied together, and the woman put on her side; a catheter was introduced, and not removed for two days; but the urine being found to escape by its side, and cause irritation, it was removed, and passed occasionally for the following five or six days. Cold water was applied, and the *vagina* now and then cleared and washed by injecting cold water. Opium was given to constipate the bowels. Two of the sutures were taken out on the fourth, and the others on the sixth day, at which time union by the first intention was complete. Three weeks after the operation she left her bed, and walked about; and in a week after, she was able to resume her usual occupation of household work. On examining her three weeks after, there was not the slightest prolapse; and when she was desired to strain violently, the *rugæ* of the *vagina* were seen, but did not protrude.]

IV.—OF PROLAPSE OF THE RECTUM.

(*Prolapsus Ani*, Lat.; *Vorfall des Mastdarmes*, Germ.; *Chute du Rectum*, Fr.)

Schacher, Dissert. de morbis a situ intestinorum naturali. Lips., 1721.
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1295. *Prolapse of the Rectum* appears under three forms; it may be either the *rectum* with all its membranes, or simply the internal membrane, or an inverted upper portion of the intestine (*Volvulus Intussusceptio*).

Although the *rectum* is pretty firmly fixed in its place, its prolapse, with all its membranes, has been improperly doubted; it occurs rarely under this form, but I have distinctly noticed it (1).

[(1) The opinion here disputed is Copeland's, who says:—"In almost every case of *prolapsus ani*, it is the *internal* membrane of the intestine only which descends through the *sphincter* muscle. The connexion of the external surface of the *rectum* is so firm with the surrounding parts, that it is almost impossible the whole should be protruded together; a separation or elongation of the union between the coats of the intestine must therefore precede the disease, and forms its essential character; whether it be produced by the effusion of blood between them, or by continued *tenesmus*, or efforts to pass the *fæces*, or peculiarity of structure, or any other cause. (pp. 74, 5.)

Syme does not agree with either Chelius or Copeland, as to what he calls *prolapsus ani*. He says:—"Such tumours consist either of the gut in its whole thickness, or of the mucous membrane alone in a state of morbid development. Being thus differently constituted, they should not be confounded together, as they usually are, but carefully distinguished, since they have no resemblance to each other, either in the nature of their production, or the treatment which they require. In making this distinction, it is fortunately unnecessary to employ any new names, since if the title *prolapsus* be confined to denote those protrusions in which the whole thickness of the gut is concerned, the other forms of the disease may all be referred to the head of Hæmorrhoids." (pp. 88, 9.)

Bushe describes only "two forms of this disease. In one the mucous membrane is alone prolapsed; whereas, in the other, all the coats of the *rectum* come down. The first is by far the most common, in consequence of the great extent and loose connexion of the mucous tunic; while the firm union of the intestine itself, with the surrounding parts, the longitudinal direction of its strongest and most numerous fibres, together with the action of the *levatores ani* muscles, offer much resistance to the descent of the entire gut." (p. 201.)

That cases do occur in which the whole gut is prolapsed, is put beyond all doubt, as Velpeau mentions that the younger Berard dissected a tumour formed by invagination of the *rectum* through the *anus* of a female. The inversion of the intestine was complete, for the *peritoneum* was included in the swelling." (p. 128.) He also mentions Paillard's case (*a*) and others cited by Nelaton.]

1296. In the prolapse of the internal coat of the *rectum*, consequent on relaxation and lengthening, merely a little reddish swelling first appears, which gradually enlarges, increases in size, becomes wider, is rounded below, but narrowed above by the *sphincter* muscle, and at its free extremity has an aperture by which the stools escape. The surface of the prolapse is, according to its different duration, and the degree of its girting by the *sphincter*, red, bluish, more or less tense or soft, covered with bloody mucus, and often divided into several lobes (1).

In prolapse of the *rectum*, with all its coats, which I have only noticed in children, a more cellular swelling, which terminates pretty pointedly, projects directly, as in protrusion of the bowel from artificial *anus;* and if the finger be introduced through the opening, the contraction of the intestinal walls is distinctly felt (2).

The symptoms which prolapse of the *rectum* especially produce, are various, according to its degree and duration, but generally they are not severe, because the *rectum* is not so very sensitive to the contact of air. If, however, the prolapse be considerable, it may inflame or become strangulated by violent contraction of the *sphincter* muscle, in which case even gangrene may occur (3).

[(1) "When the mucous membrane is alone prolapsed in the child, it assumes," says Bushe, "the appearance of a small pyramidal, red and coiled tumour; while in the adult it is less red, and generally takes the form, either of the two lateral flaps, or of a circular fold. In some of these cases, the portion of membrane thus protruded comes from the pouch of the *rectum*, while that within the sphincters remains *in situ*. When this is the case, we can pass the extremity of the little finger between that portion of the membrane which adheres to the internal *sphincter* and that which is protruded." (p. 204).

(2) Syme's *prolapsus ani*, in which the whole thickness of the gut is involved, "consists of a tumour generally round or oval, but sometimes cylindrical, varying in size from that of a small egg to that of the largest orange, exhibiting the slimy surface of a mucous membrane, and affording a copious secretion of very similar appearance to red currant jelly. It is obvious that the connexions of the lower part of the *rectum* must prevent it from descending, so as to present these appearances, which can be accounted for only by supposing that the higher part of the gut be-

(*a*) Revue Médicale.

comes invaginated in the portion below it, so as to project beyond the *anus*. In short, the derangement will be the same as that which is named *intussusception*, with this difference, that, in the latter case, the invagination occurs higher up the intestine, beyond the reach of sight and touch." (p. 89).

(3) "The symptoms of the *prolapsus*," observes SYME, "vary with the size of the part protruded, and the degree of vigour with which the intestine resents its unnatural position. They are, therefore, in general, more urgent in young persons, and less so in old people. There is always more or less uneasiness in the protruded part, and obstruction to the evacuation of the bowels; and, if inflammation commences, the sufferings of the patient become extreme, terminating even in his death, or mortification of the invaginated portion of intestine. Though the bad consequences are not always very rapid in their progress, the disease, if left to itself, can never be regarded as free from danger, and should, therefore, always be remedied as soon as possible." (pp. 91, 2). BUSHE also remarks that, "when the protrusion is allowed to remain down, it becomes engorged with blood from the pressure which the *sphincter* exercises on the veins, as is manifested by its increase in size and livid colour. If it be not soon reduced, inflammation sets in, and is attended not only with great local pain, but fever, and, in some rare cases, death ensues, in consequence of extensive peritoneal inflammation. In some other, and yet more rare cases, the protruding portion sloughs off, and a cure follows." (pp. 204, 205). A case of the latter kind is related by SAUVEUR and ANSIAUX (*a*).

Prolapse of the *rectum* is liable to be confounded with hæmorrhoidal tumours, and with *intussusception*. COPELAND says "the *prolpasus ani* has so many points of analogy with hæmorrhoids, that it may, in some measure, be considered as the same disease in a more chronic and advanced state. (p. 73). And SYME thinks that the protrusion of the mucous membrane alone should be referred to the head of hæmorrhoids. BUSHE observes, as to its *diagnosis* from hæmorrhoidal tumours, that "the semilunar form of the flaps, the extent of their base, our ability to glide the folded membrane between the finger and thumb, as well as their freedom from erection and hæmorrhage, are characters so opposite to those which pertain to hæmorrhoidal tumours, that a very cursory examination enables us to distinguish them." (p. 162). In reference to *intussusception*, he says:—"In protrusion of the *rectum*, we are not able to insert a probe or the finger higher than the border of the internal *sphincter*, in consequence of the doubling of the mucous membrane; while, in *intussusception*, no resistance is offered to the ascent of either one or the other." (pp. 205, 206.)]

1297. The causes of this prolapse are either injuries which weaken the sphincter muscle and the natural attachments of the *rectum*, as infrequent hard evacuations from the bowels, the improper use of relaxing clysters or strainings, which drive the intestine down, as severe and continued bearings down in long-continued *diarrhœa*, ascarides, hæmorrhoidal inconveniences, organic changes of the membranes of the *rectum*, stone in the bladder; farther, violent screaming and attempts at raising heavy weights, and the like. Rectal prolapse occurs most commonly in children, especially from *diarrhœa* during teething, and in old weakly subjects.

1298. Prolapse of the *rectum* is always a painful ailment. In children, it is for the most part, soon cured, if the causes of irritation of the *rectum* be removed, and more power obtained by the continued development of the sphincter muscle. In grown persons the disease is always more severe, and easily returns upon every occasion. In old prolapses considerable changes occur in the structure of the *rectum*, continued discharge of *mucus*, and the like, occur (1).

[(1) "When the descent of the bowel is often repeated," says BUSHE, "the mucous membrane becomes indurated, loses its villous surface, and, in some instances, even ulcerates. This is more likely to be the case when the *sphincter* has

(*a*) ANSIAUX, N., Clinique Chirurgicale. Second Edition, p. 179.

become ralaxed, from the repeated dilatation it has suffered, and there is a constant *nisus*, causing the bowel to contract, and force out the mucous membrane." (p. 205.)]

1299. The *treatment* consists in the reduction and keeping up of the prolapse and upon the removal of its causes.

For its replacement, if the prolapse be recent and small, slight pressure with the flat of the hand is sufficient; but if it be considerable and have existed many hours, the patient must be placed, after having voided his urine, upon his belly, with the rump somewhat raised, and the thighs separated; or he must be put upon his knees and elbows, and then with the finger smeared with oil, placed near the opening of the *rectum*, it must be attempted to press back alternately the part of the bowel nearest the opening, during which the patient should refrain from all forcing and shrieking. If in this way the prolapse be returned into the cavity of the *rectum*, it must be attempted by the introduction of the finger to carry it higher and into its original situation (1). If the prolapse be large, of many inches length, and consisting of all the coats, especially in children, the practice just recommended for its return is insufficient. The fore-finger of the right hand must be introduced into the opening of the prolapse, with which the prolapsed part is to be thrust in and then kept up with the fingers of the left hand, placed at the edge; the fore-finger is to be somewhat withdrawn, and again introduced deeper, so as by repeated thrusting inwards to return the prolapse. If the reduction be very difficult, in consequence of spasmodic forcing, relaxing antispasmodic applications, opium internally and in clysters, are useful. If the prolapse be girt by the *sphincter* muscle, and much inflamed and swollen, its return must be attempted after the use of blood-letting and cold applications. Some persons recommend also slight cuts (2). If this do not succeed and symptoms of danger ensue, the *sphincter* muscle must be divided at that part where the stricture is greatest, by means of a director introduced into it, and a button-ended bistoury, which is advantageously preceded by the use of a *speculum ani*. If the bowel still cannot, on account of the great swelling, be reduced, it must be only gradually returned, as it is diminished by the use of proper remedies.

[(1) The plan recommended by Brodie for the treatment of prolapsed *rectum* in children is the following:—"Purge him with calomel and rhubarb occasionally; be very careful about his diet, that he does not eat a great quantity of vegetable substance, which tends to fill up the cavity of the bowel, while it affords but little nourishment, and every morning let some astringent injection be thrown up. That which I have generally used is a drachm of *tinct. ferr. mur.* in a pint of water, and two or three ounces or more of this, according to the age of the patient, may be injected into the *rectum* every morning, the child being made to retain it as long as possible. I never saw a case of *prolapsus* of the *rectum* in a child which was not cured in this manner." (pp. 845, 46).

The treatment of prolapsed *rectum* in children, in whom it is frequently of considerable length, is a very troublesome matter. The attempt to reduce it gives the child pain, and causes him to cry, and thus force the bowel down repeatedly almost directly after its return, the relaxation of the *sphincter* being so great, in general, that it affords little opposition to the descent of the gut. I have not been in the habit of using injections; but have merely kept the child as much as possible in the horizontal posture, and, having returned the bowel, have applied a pad either of linen alone, or of cork covered with linen, and of corresponding size to the breadth of the protruded gut, fastening it with a T-bandage. If the protrusion can be only

a little restrained at first, it is pretty certain that continuing the same remedy will ultimately be effective, although but very slowly. Attention to the bowels, so that the stools should be thin, and passed with little effort, is a very important part of the proceeding; and for this purpose I prefer a tea-spoonful of castor oil occasionally, which I think better than calomel, as less likely to produce the *tenesmus* so frequently following the use of that medicine. The nurse, however, must be taught how to return the gut, and strictly enjoined to return it immediately after the motion has been passed, and not to allow the child to sit straining on his chair, as is too commonly permitted.—J. F. S.

(2) Dupuytren, with great propriety, objects to this practice. He says:—"Some persons recommend scarifications; but, as they cause wounds, and consequently inflammation of the large bowel, they should not, as far as possible, be employed. The same objection applies to leeches, which may produce internal or external bleeding, and ulceration of the gut." (p. 159.)]

1300. In order to prevent the reprolapse, it must be endeavoured to get rid, as far as possible, of the causes upon which the disease depends, to diminish the irritation of the *rectum*, the bladder, or neighbouring parts, to extirpate the hæmorrhoids and the like (1), and to restore to the *rectum* its natural powers by cold bathing, by cold or astringent clysters of red wine, and the like. To prevent the reprolapse, a piece of sponge dipped in cold water, is fastened with a T-bandage, or the application of large strips of adhesive plaster, from the region of the *pubes*, near to the aperture of the *anus* up to the region of the rump-bone, so that merely a space is left for the passage of the stools (*a*); the bandages of Juville (*b*) and Gooch (*c*), are to be preferred as most suitable; as also the application of a pad of lint, in such way as not to prevent the discharge of the stools, a hollow cylinder of ivory or of caoutchouc, by which it is hoped to keep the relaxed walls in their proper place, but which generally cannot be worn, and still farther weakens the *sphincter*. In women, the prolapse of the *rectum* may be kept back by a pessary introduced into the *vagina*, only it must not press either too much or too little upon the *rectum*.

Klein (*d*) recommends, as a very efficient remedy, even in very old prolapses of the *rectum*, sprinkling a powder, consisting of equal parts of gum arabic and *colophonium*; by the use of which the prolapse returns, and this is to be repeated as often as the prolapse recurs. I have not, however, noticed any particular benefit from it. Schwarz (*e*) recommends the extract of *nux vomica*, as a very efficient remedy in all cases of *prolapsus ani*, one to two grains dissolved in two drachms of water, of which from six to ten drops are to be given every four hours to children; and to older persons, even fifteen drops; frequently he gives it in connexion with some grains of extract of rhatany.

[(1) When an adult labours under prolapse of the *rectum*, "consequent on a protrusion of piles, the first thing to be done," says Brodie, "is to destroy the piles. Let the patient sit on a pan of hot water, and the *sphincter* muscle being relaxed, and the parts distended with blood, the piles and *rectum* will all protrude together. You must then tie the piles, which you can easily do, your assistant holding the *rectum* on one side, while you apply the needles and ligatures on the other. Having tied the piles, you return the *rectum* into its proper place; and you will probably find that, in curing the piles, you have also remedied the *prolapsus* of the bowel; but, if the patient neglects himself afterwards, as the piles return, so the *prolapsus* returns with them." (p. 846.)]

(*a*) Niemann, in Knescke's Sammarium, vol. x. pt. vi.

(*b*) Abhandlung, ueber die Bruchbänder, u. s. w. p. 102, pl. xii.

(*c*) Hofer, Lehrsätze des chirurgischen Verbandes, vol. ii. p. 384, pl. xvi. fasc. 100.

(*d*) Heidelberger klinische Annalen, vol. ii. pt. i. p. 110.

(*e*) Hufeland's Journal, 1835, Feb. No. 4.

1301. All these modes of treatment are, for prolapse of long standing, really fruitless, and accompanied with considerable inconvenience to the patient (1). In these cases, the treatment prescribed by Dupuytren (*a*) is most effective; the patient is put upon his belly, his head and shoulders low, but his *pelvis* on the contrary much raised by one or several pillows, for the purpose of rendering the aperture of the *anus* more distinct. Two, three, four, five, or six, of the radiating folds surrounding the *anus*, which are either level, or more or less prominent, are to be seized with a pair of pincers, with somewhat flattened points, one after another, right and left, and even before and behind, and each fold, as raised, is to be taken off with scissors curved towards the surface, and the cut is then to be continued to the *anus*, or even higher into it; but it is ordinarily necessary only to continue the cut some lines upwards. In less relaxation, two cuts, in greater relaxation, several cuts are to be made on each side. Bleeding and other symptoms do not come on; but usually during the operation there is violent contraction of the *sphincter*. The wound is to be simply treated, and after scarring, the opening of the *anus* has proper firmness, and the prolapse does not recur (2).

The application of the actual cautery, according to Phillips (*b*), corresponds in its operation to excision; according to the state of the case, from one to four applications must be made; and, indeed, if the disease be recent, it may be merely applied to the edge of the *anus*, without touching the mucous membrane of the *rectum*; but if the case be old, the white-heated iron must be carried over the mucous membrane. The length of the slough should be half an inch. Scarring produces such contraction of the *anus*, that reprolapse is thereby prevented.

[(1) The difficulty, and even impossibility, of returning the bowel sometimes occurring in old prolapse of the *rectum*, does not depend on the contraction of the *sphincter*, as might be supposed. This was first noticed by Hey, who observes:—"Although the prolapsed part of the intestine consisted of the whole inferior extremity of the *rectum*, and was of considerable bulk, yet the impediment to the reduction did not arise from the stricture of the *sphincter ani*, for I could introduce my finger with ease during the *procidentia*; but it seemed to arise from the relaxed state of the lowest part of the intestine and of the cellular membrane which connects it with the surrounding parts." (p. 424.)

(2) It has been disputed whether Dupuytren is to be considered as the originator of this operation, or whether it is merely a modification of Hey's. There can be no doubt that the principle was the same, that of diminishing the aperture of the *anus*; but the two operations differ from each other as much as Copeland's presently to be described, and far preferable to either, differs from both. Hey's account of his operation will show its total difference from Dupuytren's; and that able French Surgeon is fully entitled to the merit of whatever credit belongs to its proposal; although I must confess I think Copeland's operation is best of the three recommended. Hey says:—"The relaxed state of the part which came down at every evacuation, and the want of sufficient stricture in the *sphincter ani*, satisfied me that it was impossible to afford any effectual relief to my patient, unless I could bring about a more firm adhesion to the surrounding cellular membrane, and increase the proper action of the *sphincter*. Nothing seemed so likely to effect these purposes, as the removal of the pendulous flap and other protuberances, which surrounded the *anus*. I hoped the inflammation caused by this operation would produce a more firm adhesion of the *rectum* to the surrounding cellular substance; and I could not

(*a*) Above cited, p. 163.—Journal Général de Médecine, vol. lxxxi.—Von Graefe und von Walther's Journal, vol. v. pt. iii. p. 524.—Von Ammon, Erfahrungen und Bemerkungen über Dupuytren's Operations-methode, den Mastdarmvorfall zu beseitigen; in Hecker's Annalen, March 1829, p. 261.—Macfarlane, J., Clinical of the Surgical Practice. Glasgow, 1832. p. 151.

(*b*) London Medical Gazette, vol. xi. p. 384.

doubt that the circular wound would bring on a greater stricture in the *sphincter ani*." (pp. 443, 44.)

It is not out of place to remark in reference to these operations, that VELPEAU observes:—"Very frequently a portion of the fleshy coat of the intestine is found accompanying the mucous coat in prolapsed *rectum*. There is no inconvenience in removing with the mucous membrane a portion of the muscular tissue; on the contrary, the cure will be more complete, and I have some disposition to believe that the want of success which has occasionally followed the operation has depended on the omission of this precaution." (p. 135).

The only means of "restoring the disturbed union between the inner membrane of the intestine and its external surface," is, according to COPELAND, "by exciting a degree of inflammation on the *external* surface of the inner membrane, sufficient to produce a union and consolidation of the parts together." He objects to the use of stimulating injections, as inflaming the mucous surface, causing great pain and distress, "without any material benefit to the disease; for the inflammation is propagated along the mucous surface, without extending to the deeper seated parts or external coat of the intestine." Having shown that the inner coat of the alimentary canal loses a considerable portion of its villous nature as it approaches its extremities, that wounds at such points are less serious than when inflicted on the more interior portions of the canal, and that "the degree of pain is beyond all comparison, less in proportion as the part wounded or tied is more removed from the *anus* and the *cutis* surrounding it; an operation or ligature which would be violently painful at the circumference of the *anus* if it involve the smallest portion of the skin, being spoken of as little more than uneasiness, or not calling forth any expression of pain, when performed on a part of the membrane more removed from the seat of external sensation; and the consequent fever and inflammation having the same relation to the part," he proceeds to observe, that "the only effectual means then of producing this desirable union between the coats of the intestine, is by a wound, or a removal of a small part of the inner membrane which protrudes at the *anus*, and constitutes the disease." * * * That the removal of the (entire) protruded portion is not very essential to the cure of the disease, I think will appear evident, if it be considered how very small a part of the inner membrane being cut or tied away, in proportion to the whole bulk, will be sufficient to prevent the remainder from protruding. I have, in some instances, been obliged to repeat the operation on the opposite side of the gut, when the adhesion formed by the wound was not sufficient to support the whole circumference of the canal. But in one case I removed the ligature immediately after it had been very tightly applied, and returned the intestine. The cure was complete; but I do not know whether the part sloughed or not to which the ligature had been applied. This injury done to the inner membrane of the intestine, then, is the most certain mode of producing that degree of inflammation, and consequent adhesion, which produces the cure of the disease, and in which, in fact, the cure consists.

"The mode of performing the operation which I think is most advisable, and which I have very frequently performed without any one unfavourable circumstance, is, the bowels, being well emptied previously, and the time chosen when the projection is considerable, to pass a tight ligature round a very small portion of the inner membrane, at a part not immediately in the vicinity of the *anus*, that is, above the union of the *cutis* with the mucous membrane, and to return it, together with the ligature, into the gut. This is not, for the most part, a painful operation; but it is advisable that a grain of opium, or a few drops of laudanum, be given to procure ease, and also that the bowels may be somewhat confined for a day or two after the operation; for an evacuation during the active stage of the inflammation would give considerable uneasiness, and interrupt the adhesions which we depend on for the cure. Nevertheless, the cure has not been less complete, because the parts have come down in a more swelled and painful state for several days after the operation. The patient must be directed to keep his bed, should live very sparingly, and cloths dipped in GOULARD water, or laudanum and water, should be applied when the pain or inflammation require it. In two or three days, if the bowels have not acted spontaneously, some mild aperient should be given. In about five or six days the ligature comes off, and shortly afterwards the part will heal, and cease to come down, or come down, only in a much less degree than before the operation." (pp. 77–84).

This mode of treating prolapse of the *rectum* is now pretty commonly employed; and from my own experience, I may add that COPELAND has very faithfully and truly described its simplicity, its almost entire freedom from pain, and its great advantages. I have never had occasion to perform HEY'S operation, or its modification by DUPUYTREN; and I believe that in almost all cases COPELAND'S method will be found amply sufficient, and infinitely less painful.—J. F. S.

M'CORMAC says (*a*), that "reflecting on the procedure in question, (DUPUYTREN'S operation), it occurred to him that the same result might in a measure, at least, whilst the child went to stool, be secured by careful manual traction. * * * Accordingly when the child went to stool, the skin, anterior to the *anus*, was drawn to one side by means of the fingers extended around. The little girl submitted to this with some reluctance, and complained that she could not evacuate her bowels. She was encouraged, however; a stool was obtained; from that day and date, now a month since, the bowel has not once descended. * * * The little girl requires comparatively little attendance, her mother, in fact, is only required to stand by, and in a short time, it is to be hoped, her onerous and anxious ministry will wholly cease." (p. 417.)]

1302. In an old prolapse of the *rectum*, a considerable enlargement, and at last hardening of the prolapsed part, is often gradually produced by the contact of the air, rubbing, and so on. If in such case the return be not possible by continued supine posture, by keeping up pressure and the use of cold applications, or if doubtful symptoms arise, the protruded part of the *rectum* must be cut off at its base. In doing this considerable bleeding is always to be feared, for which plugging, employed in the way prescribed, (*par.* 939,) is no certain remedy, as it is easily thrown off, or displaced, by violent forcing, and, as I have seen, fatal bleeding ensues. It is preferable, after the removal, to touch the bleeding part with the actual cautery, by which the bleeding is more certainly stanched, and the elastic power of the *rectum* increased. In order to meet the danger of bleeding in cutting off a degenerate prolapse of the *rectum*, SALMON (*b*) has proposed the following proceeding, which he has found by experience to be sufficient. The patient being properly placed, and the buttocks separated from each other by an assistant, he thrusts one or more stout straight needles from above downwards, through the base of the swelling. As the needles penetrate the muscular coat, they prevent its return after the tumour is cut off. He now takes hold with the hook, or with forceps, of a portion of the swelling, draws it gently towards the opposite side, and cuts it off with one stroke of the scissors, as deep as the line between the mucous and muscular coats, which must be spared, as otherwise there will be slight difficulty in going to stool. In the same way all the other portions are to be removed. After the removal, the bleeding is to be stanched by the usual means; cold water is usually sufficient; most commonly it stops of itself. If the vessels are to be tied, it may be done easily, as the wounded surfaces are kept out by the needles. The needles are to be left in for an hour; and the wounded surface should be anointed with oil.

In irreducible prolapse, which causes severe and dangerous symptoms, the application of the actual cautery was early recommended by LEONIDAS, SEVERINUS, TULPIUS, LEVRET, and others.

[The use of the actual cautery to produce sloughing of an obstinate prolapsed *rectum* was recommended by ANSIAUX (*c*) in consequence of the cure he had noticed

(*a*) Dublin Journal of Medical Science, vol. xxiii. 1843.

(*b*) Practical Observations on Prolapsus of the Rectum. London, 1831. 8vo.

(*c*) Above cited.

to result after a natural slough of the protruded gut; he operated on three women at the different ages of sixty-two, thirty-five, and sixty years, with success. Dupuytren objects (*a*) to the cautery, that "independent of the severe pain it causes, it may produce violent and more or less serious inflammation of the intestine and of the neck of the bladder." (p. 161.)]

1303. The prolapse of an unsheathed upper intestine, of the lower end of the *colon*, of the *cæcum*, even of the *ileum*, is usually distinguished by its having some inches of length, and by its condition. The only aid consists in the return of the prolapsed part into the *rectum*, and in keeping it up. If the finger be insufficient for its return, an elastic tube, and even the dashing of cold water (Boyer) must be used. A very large portion of ensheathed intestine of considerable length has been observed to separate and to be thrown off.

[In connexion with prolapse of the *rectum* it may be well to notice here two conditions mentioned by Bushe.

1. *Relaxation of the Anus*, which "depends upon a want of contraction in the sphincters the causes of which are:—disease or injury of the brain or spinal cord, exhaustion attending weak health, sedentary habits, protracted diseases or old age, excessive or repeated dilatation of the *anus*, produced by straining in chronic dysentery, the introduction or extraction of foreign bodies, and the growth of tumours from within the intestine, and finally operations performed for fistula, fissure, &c. The consequences of this affection are proportionate to the want of power in the sphincters; thus, when they are completely paralyzed from disease, or injury of the brain or spinal cord, the *fæces* are discharged involuntarily; whereas in that diminution of tonicity in their fibres, which depends upon constitutional exhaustion, the discharge of *mucus* attended perhaps with slight excoriation of the verge of the *anus*, is the most troublesome symptom. It not unfrequently happens that the mucous membrane is protruded, and should the dilatation be considerable and prolonged, especially in elderly persons, the surrounding skin will lose its elasticity, which it is not very apt to recover, even though the sphincters be restored to their primitive condition, The treatment will depend upon the cause; if the brain or spinal cord be at fault, these must be looked to; if there be hæmorrhoidal or other tumours, they must be removed; and if the general health be impaired, it must be improved. "The best local remedy," says Bushe, "is the injection of half a pint of cold water, three times a day." Stimulating vapours and compresses dipped in astringent washes are recommended by some practitioners. (pp. 213, 14.)

2. *Relaxation of the rectum with invagination of the mucous membrane* "is disposed to by repeated distention of the bowel with *fæces*, or injections. When the *rectum* is empty or relaxed, and the individual strains violently to effect a motion, the mucous membrane may be forced into the inferior part of this intestine, and thus partially obstruct it, so that the fæcal matter lodged above can be but imperfectly discharged. If the finger be introduced, the nature of the case will be easily discovered. The bowels are confined; the calls to defecate are frequent, urgent, and generally ineffectual, nothing being voided but mucous or puriform matter, often streaked with blood; finally, the pain is always considerable, but occasionally violent. A well-regulated diet, gentle aperients, emollient followed by astringent injections, and the use of the inflated gut, or bougie, will generally suffice for its removal. If, however, the nature of the case be not detected, one of two things must follow: either a complete *prolapsus* will ensue, or what is worse, the displaced membrane will, from irritation and inflammation, become thickened and indurated, and the opening through it contracted. (pp. 215, 16.)

The case quoted by Salmon, and which was under the care of Somme (*b*), appears to me to have originated in this relaxation, though the young woman is stated to have been "long affected with a contraction of the *rectum*, three or four inches above the *anus*; and the bridle forming the ring, hard, callous, and so contracted, that it only allowed liquid matters to pass, whence arose obstinate constipation and colic;" for Somme continues:—"I tried dilatation with bougies, which had momen-

(*a*) Above cited. (*b*) Etudes sur l'inflammation. Paris, 1830. 8vo.

tary success." Now if a stricture had formed, the bougie would not have passed, but if, as seems probable, the obstruction was caused by the descent and ensheathing of the mucous membrane, the introduction of the bougie would carry it up and unfold it, and thus the obstruction be got rid of for the time. That this was really the case seems to be proved by her becoming attacked some time after with severe constipation, which lasted three weeks, accompanied with vomiting, swelling, and pain in the belly, violent colic and fever. She was treated for *enteritis*, the constipation overcome with clysters, which were followed by copious sanguineous *diarrhœa*. Subsequently the evacuations became free, the fever ceased, and some days after "a piece of membrane protruded by the *rectum*, which being slightly pulled, brought away a portion of intestine about a foot long. This was not false membrane, but wholly intestine; internally the villous coat was black, externally the surface was smooth, and there was a groove upon it indicating the attachment of the mesentery."

Salmon makes a very good observation in reference to the incautious use of clysters, which have been noticed as one cause of relaxed *rectum*. "Many persons," says he, "are daily in the habit of throwing immense quantities of fluid into the *rectum*, by which it is forcibly distended and irritated; thus, instead of the enema affording relief, it is productive of serious irritation; but a far greater evil resulting from this practice is, that the *rectum*, from the immoderate distention thus induced, is rendered unsusceptible of the natural stimulus arising from the *ordinary* accumulation of fæculent matter;" and in support of this statement he relates a case of supposed stricture of the *rectum*, in which he passed number eleven bougie without difficulty, to the great surprise of the patient, who for some time had lost nearly all power of relieving the bowels which never acted without the assistance of medicine or an enema, "he having been in the habit of pumping a couple of quarts of thin gruel into the intestine once, and occasionally twice every day. (pp. 23, 24.)

D.—OF CHANGED DIRECTION OF THE WOMB.

Medical Observations and Enquiries, vol. iv. London, 1771.

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Meissner, F. L., Die Schieflagen und die Zurückbeugung der Gebärmutter, nebst einer Zugabe, über die neuerlich bekannt gewordene Umbeugung derselben. Leipzig, 1822.

Mende, L., Von der Zurückbeugung der Gebärmutter in geschwangerten und ungeschwängarten Zustande; in his Beobachtungen und Bemerkungen aus der Geburtshülfe und gerichtlichen Medicin, vol. ii. p. 150.

Blundell, James M. D., above cited.

Rigby, Edward, M. D., on Retroversion of the Unimpregnated Uterus; in his Reports on Diseases of Females; in Medical times, vol. xiii. 1845.

1304. The womb is subject to various changes of direction, inasmuch as its axis may deviate backwards, forwards, or to either side, from that of the *pelvis*. The former two states only will be here specially considered.

1305. If the long axis of the womb vary so much from that of the *pelvis*, that cutting it at a more or less acute angle, its base be directed towards the rump-bone and the mouth of the womb towards the share-bone, this displacement is called *Retroversion of the Womb* (*Retroversio Uteri*, Lat.; *Rückwärtsbeugung der Gebärmutter*, Germ.; *Rétroversion de la Matrice*, Fr.) but if its base drop towards the share-bone, and the mouth of the womb be inclined towards the rump-bone, it is called *Antroversion* (*Antroversio Uteri*, Lat.; *Vorwärtsbeugung*, Germ.; *Antroversion*, Fr.) The former position is more frequent than the latter, and both may occur to a greater or less extent.

1306. *Retroversion of the Womb* occurs more frequently during pregnancy, especially in the third and fourth months, than in women not pregnant; it is, however, in these often enough, and (according to Schweighaeuser and Schmitt (*a*) even more frequent than during pregnancy; and my own observations on this point concur with that opinion.

[Rigby is also of this opinion, and observes:—"I am sure I have the confirming testimony of Dr. Simpson and Mr. P. Smith, when I state it to be one of the most common displacements to which the *uterus* is liable in the unimpregnated state, and that this form of it occurs *far more* frequently than the ordinary retroversion during pregnancy," (p. 124.) There is, however, a difference between the retroversion which occurs whilst the woman is pregnant, and that when she is not so; for Rigby observes:—"The case now alluded to is where the *fundus* is bent downwards and backwards; so that it can be felt close behind the *os* and *cervix uteri*, which, instead of being forcibly dragged upwards and forwards behind the *symphysis pubes*, is little, if at all, removed from its natural situation. This state of retroflexion (a term which Rigby prefers to retroversion, J. F. S.) is chiefly met with in the unimpregnated *uterus*, although it sometimes occurs during pregnancy. (p. 124.)

"In different women," observes Blundell, "the womb varies very much in its virgin size; for in some it is three times as large as in others. Now if it so happen that the womb is very small, and that retroversion has taken place without impregnation, the pressure which it occasions may be so inconsiderable, that the nature of the case may remain unsuspected; but when the womb, though unimpregnated, chances to be of large size, especially if the *pelvis* is small, or contracted, considerable pressure may be produced, and we are first led to investigate its nature, in consequence of the irritation and obstruction of the *rectum* and the bladder, when the accident is soon recognised by the characteristics before given." (p. 19.)

1307. It is probable that retroversion of the womb in pregnant and not pregnant women is not produced at once; but by degrees, under favourable circumstances, a complete retroversion is gradually formed from a simple reclining of the womb. The following may be noticed especially as predisposing causes, slight inclination and great capacity of the *pelvis*, low position of the intestines, perhaps also Douglas's

(*a*) Richter's chirurgische Bibliothek, vol. v. p. 132, vol. ix. p. 310.—Stark's Archiv. für die Geburtshülfe, vol. iv. p. 637.—Osiander; in Salsburg. Med. Chirurg. Zeitung, 1808, vol. iv. p. 170.—Brünninghausen; in von Siebold's Journal für Geburtshülfe. Frauenzimmer und Kinderkrankheiten, vol. iii. p. 59.—Schweighaeuser and Schmitt, above cited.

folds, peculiar deviation of the original formation (*a*), relaxatiou of the broad and round ligaments of the womb. The occasional causes are, pregnancy, overfilling of the urinary bladder, stools unfrequent or accompanied with great effort, constant lying on the back, increased weight, swelling, or other degeneration of the hinder wall of the womb, violent straining, and so on.

Retroversion cannot occur in a perfectly healthy state of the womb; were it even possible, it could not readily produce such severe symptoms. The chronic inflammatory state of the womb, which most commonly gives rise to retroversion, causes pain and dragging in the back and loins, difficulty in walking, difficulty in voiding the urine and in going to stool. On examination, a lower position of the womb, swelling and sensibility of its vaginal portion are observed; most commonly, also, is there a flow of *mucus* from the generative organs. The two last symptoms distinguish it from pregnancy (*b*.)

1308. The symptoms which indicate retroversion of the womb depend on the obstructed or completely suppressed discharge of the urine and stools, and on the diseased changes which arise in the displaced womb. These symptoms in general occur suddenly in retroversion during pregnancy, which greatly prevents and often entirely suppresses the voidance of the stools and urine; severe and extremely painful dragging come on with a feeling of pain, weight, and fulness of the belly, also distention and painfulness, disposition to vomit and actual vomiting, fever, extreme restlessness, abortion, and even death from tearing of the bladder, and inflammation and gangrene of the intestines of the belly.(*c*)

The seeming retroversion of the womb, mentioned by Mende, must be noticed, in which case at the later periods of pregnancy, its hinder wall expands like a sac, producing similar symptoms to the true prolapse, usually terminates in abortion, and is distinguished by the mouth and neck of the womb not at all deviating from their natural position (*d*.)

[(1) Blundell observes that "the patient often tells her adviser that she has been placed in some situation of restraint, and that afterwards, on retiring, and trying to evacuate the contents of the bladder, not a drop of the secretion would pass away, and this has occurred perhaps for hours before you see her, the accumulation having continued ever since; so that there is a great deal of pain of the *abdomen* and heat, with forcing and fluctuation, which may be felt as distinctly as in a case of *ascites*. I wish it to be understood, however, and very important it is that this should be known, that in the retroversion of pregnancy, you have not always, nor I think generally, these *complete retentions* of urine; for often, where the *uterus* is retroverted, the retention is partial. In a case recorded by Van Doeveren, although the woman passed her urine every day, still she died from a ruptured bladder. * * * Day after day the fluid is sparingly emitted, but never in such quantity as to empty the bladder completely, till by-and-by, perhaps, the secretion begins to steal away involuntarily, or she may have strong efforts to pass the urine, even against her will,

(*a*) Schreger; in Horn's Archiv. 1817, March and April, p. 311.

(*b*) Robertson, Cases and Observations on simple chronic inflammation of the Uterus, in which state its organ may become retroverted; in Edinburgh Med. and Surg. Journ. 1822, Oct. p. 520.

(*c*) Linne and Hunter; in Med. Observ. and Enquiries, vol. iv.—Saxtorph, above cited.—Wilmer, Cases and Remarks in Surgery, London, 1779;—Henschel; in Loder's Journal, vol. iii. p. 536.—Naumberg; in Stark's Archiv. vol. vi. p. 381.—Van Doeveren, Specimen observationem academicarum ad monstrorum historiam, anatomen pathologicum et artem obstetriciam speatantium. Groning; 1765.—Reid's Fall einer Rückwärtsbeugung der Gebärmutter in fünften Monate der Schwangerschaft; in Frorief's Notizen, September, 1838, p. 304.

(*d*) On Retroversion of the Womb after birth, with tearing of the hind wall of the *vagina* and prolapse of the *fundus uteri*.—See Dubois; in Presse Médicale, May, 1837. No. 20.—Schnachenberg; in Casper's Wochenschrift, 1838. No. 34, 35.

and with every effort a small gush only may be produced, or there may be a continual dripping, and yet, notwithstanding all this, an accumulation of water may go on very gradually, so that several pints, nay, several quarts, may be gradually accumulated, as in the following example:—'A woman labouring under symptoms like *ascites*, a practitioner proposed, I think, the operation of tapping. There was, however, some obscurity about the case—a great deal of pain more especially—and, an obstetrician being called in, in consequence, a catheter was introduced, and water drawn to the amount of seven quarts, which had been accumulating in the bladder for two or three weeks, in consequence of a retroversion of the *uterus*.'"—(pp. 7, 8.)

(2) Lacroix remarks (*a*) that, whether by sympathy or direct irritation, is not so evident; but it is often seen, nevertheless, that when the retroversion is sudden, either in the virgin, or pregnant female, hiccup, flatulence, vomiting, fainting, &c., commonly show themselves; and, even when the displacement is more gradually produced, analagous symptoms of less intensity are present.]

1309. On examination with the finger in the *vagina*, the mouth of the womb is found behind or above the share-bones; often scarcely, sometimes not at all reachable, and on the hind wall of the *vagina* is the *fundus* of the womb, descending against the rump-bone like a lump, which on examination is felt through the *rectum*.

["In examining a case of retroflexion of the unimpregnated womb during life, the finger," says Rigby, "can frequently reach a firm globular mass like a walnut, situated behind the *cervix uteri*, and evidently posterior to the *vagina*. At the first touch, or to one unacquainted with this condition of the womb, it seems like a lump of scybalous matter in the *rectum*; for in many, perhaps most instances, the finger cannot reach sufficiently high up to distinguish the continuity of this mass with the *cervix*, the point of flexion being usually in the body of the *uterus*, close above its junction with the *cervix*. This, however, varies considerably, both in different cases and in the same individual, and at different times. In some cases the curve is much higher, so that the whole of the *uterus* seems to be in the natural position except a sharp bend or double at its uppermost portion. In others, the point of flexion is so low down that it can be easily reached, and the *fundus* is felt much lower than the *os uteri*.

"On examination *per rectum* we feel the same hard lump through the anterior wall of the intestine; and by being able to reach higher up in this direction than with the finger *per vaginam*, we can frequently verify or correct our first impression. But it is by the uterine sound, invented by Professor Simpson, that we obtain such peculiarly valuable and interesting results in this form of uterine displacement. On passing the instrument in the usual direction upwards and forwards, it becomes almost immediately arrested; but on turning its point backwards, exactly in the contrary direction, it will pass readily along the *cervix*, and then glide downwards and backwards, until the measure mark of two and a-half inches, having reached the *os uteri*, shows us that it has entered to the natural extent of the uterine cavity; the point is now evidently in the centre of the tumour between the *rectum* and *vagina*, as may be felt through either of these passages, thus proving it to be the *fundus uteri* in this unnatural position. By carefully turning the instrument round, and carrying its point upwards and forwards in the natural direction of the *uterus*, we shall also carry up the *fundus* upon it and restore the *uterus* to its proper position. On examination either by the *vagina* or *rectum*, we now find the tumour has entirely disappeared; and as far as the finger can reach through the latter passage, the *uterus* will be felt in a direction upwards and forwards, and held in that position by the sound within it. In some instances, the *uterus*, when once replaced, maintains its natural position either permanently, or at least for some little time afterwards; but in many, especially those of long standing, and where the *fundus* has been forced very low down, the handle of the sound requires to be held firmly so as to keep the *uterus in situ*; and the moment we loose our hold of it, (the handle,) it will turn round, rising at the time upwards and forwards towards the *symphysis pubis*, showing that its point has turned downwards and backwards. In other words, the *uterus* has returned

(*a*) Annales de la Chirurgie, vol. xiii. p. 457, 1845, April.

to its former state of displacement, carrying the sound along with it; we shall now again feel the tumour in the recto-vaginal sac, containing the point of the sound within it.

"On examination *per vaginam* we shall find that pressure on the retroflected *fundus* seldom produces pain until we try to push it up against the ovary; the sound will pass into the *fundus* without causing much uneasiness, but if we carry the finger to the upper parts of the *vagina* into the vicinity of the ovary we shall excite severe pain. The same will be observed in examination *per rectum*: the instant we press up the *uterus* the patient complains greatly, but *per se* the *uterus* is not painful, and we can ascertain that the intensely painful spot is distinctly above the tumour formed by the retroflected *uterus*. These and other symptoms resulting from ovarian irritation or inflammation cannot, therefore, be looked upon as a necessary accompaniment to retroflection, although there is no doubt that they are frequently present; but the two affections are sufficiently often associated to justify a careful examination of the position of the *uterus* in every case of chronic *oophoritis*.

"In some cases the canal of the *cervix* is so closed at the point of flexion as to resist every attempt to introduce the sound, and the dilator must be carefully premised until a sufficient passage has been obtained. I have reason, however, to think that when the canal is so closed as to require the dilator, it is rather owing to a congenital formation than to the effects of the bent state of the *uterus*, which last is, however, sufficient not only to obstruct the free discharge of the *catamenia*, but also to prevent conception." (p. 125.)]

1310. The symptoms do not occur so quickly in retroversion of the womb in women who are not pregnant, and vary according to the degree of retroversion and the condition of the womb. Only with slight reclination and little sensibility of the womb do no symptoms occur; if there be much sensibility, dull pain occurs in the bottom of the *pelvis*, dragging, painfulness on examination, sometimes difficulty in the discharge of the urine and stools, and gradual organic changes in the womb. In a greater degree of reclination, swelling up of the whole womb is observed, but especially of its hind part with increased sensibility to the touch; increased weight and difficulty in moving about. The sensation of constant pressure in the region of the *rectum*, with difficulty in voiding the stools and urine. In completely retroverted womb, dragging pains, swelling, weight, immobility of the womb, often inflammation and great painfulness on examination, suspended or irregular menstruation, and difficult voidance of the urine and stools occur. If the retroversion take place after delivery, it may cause continued and dangerous flooding (*a*). It is self-apparent that these symptoms must be variously modified by the simultaneous changes in the structure of the womb, and that examination must demonstrate a different relative position of the mouth and base of the womb, according to the different degree of displacement. If the womb be fixed in its unnatural position by adhesions, the retroversion may even be fatal from the inflammation of the intestines lying in the *pelvis* (*b*).

["The presence of this displacement is not necessarily indicated," says Rigby, "by any peculiar symptoms; indeed, in some instances, I have found it existing without a single circumstance to make the patient suppose that she was otherwise than in a state of the most perfect health, even as regards the catamenial periods. Generally speaking, however, there is a dull pain and sense of pressure about the *sacrum*, verging to one side or the other, according to the direction which the *fundus* has taken. In some instances she has pain and numbness down the thigh of that side, with difficulty or inability to move or stand upon, and probably arising from

(*a*) Brünninghausen, above cited.
(*b*) Schweighaeuser, above cited, p. 253.—Schmitt, above cited, p. 16.

the *fundus* pressing on some of the sacral nerves, since the pain is instantly removed by the replacement of the *uterus*, and the numbness or lameness ceases in an equally striking manner. At times this pressure increases to a severe bearing down, which after a while again subsides, and which is probably connected with the passage of *fæces* along the neighbouring intestines, and more or less depressing the *fundus*.

"In a considerable number of cases there are distinct marks of ovarian inflammation on the side to which the *uterus* inclines; or at any rate I may say that, in a large majority of cases, as it is the left side to which the *uterus* inclines, so is it also the left ovary which is most frequently painful. These are, in fact, the ordinary signs of *oophoritis*." (p. 125.)]

1311. As to *prognosis*, the bad symptoms have been already mentioned which especially occur in retroversion. It must be especially observed in not pregnant women, whether the organic changes of the womb be preceded by retroversion, or whether they be consequent on it; in the former case the restoration of the proper position of the womb is the most perfect cure, but in the latter not.

[" With respect to the prognosis of retroversion," BLUNDELL remarks, "that where the womb is replaced, the patient, in general, does well enough, provided you proceed on the principles prescribed; yet it is not impossible that miscarriage may take place after reduction; for in two or three instances I have known this take place. Inflammation of the bladder of the acuter kind may occur, and you may have a chronic disease of this organ. Where there is a good deal of inflammation, your patient may die of exhaustion. You may find that some officious hand has thrust a catheter through the back of the bladder into the *peritoneum*, and that the escape of the urine into the *peritoneal* sac has destroyed the patient. The bladder in some rare cases may be burst open, of which I possess a very beautiful preparation. The *uterus* is as large as a child's head; above the retroverted *uterus* is the bladder which has been ruptured. It is remarkable that in this rupture of the bladder, which has arisen from its over distention, it is not the front, that surface of it, I mean, which has no *peritoneal* covering, but it is the posterior surface, invested by the *peritoneum*, the back part of the body, which is the region of the rent. Now it was this which first led me to propose, that where a rupture of the bladder takes place in any case, but especially in a retroversion of the *uterus*, we should not give the patient up for lost; for if there is reason to believe that the bladder is burst into the *peritoneal* sac, we might make an opening into the *peritoneum*,—say above the *symphysis pubis*,—by which we might discharge the urine, and then injecting distilled water of the temperature of 98°, we might wash the *viscera*, so perhaps as to prevent a general *peritonitis*; this done, we might draw the bladder up to the opening, and close the rent by ligature. This operation I have performed on several rabbits; in one or two experiments I brought the bladder out, tied it up, and took away about one quarter of it, viz., the whole of the *fundus*, and the animal did perfectly well. This operation I have never had occasion to try on the human subject; but in a case otherwise desperate, I should be inclined to recommend it. I may here remark, that since I have suggested this method of closing the bladder by ligature, Mr. TRAVERS (*a*) has performed the operation on the stomach; there was a slight wound in the organ; he boldly tied up the aperture; the thread came away, and the case did perfectly well." (pp. 19, 20.) It must not be supposed that TRAVERS made the ligature on the wounded stomach from BLUNDELL's suggestion; ASTLEY COOPER had long before tied up the hole in a gut, wounded during the operation for strangulated rupture, and the case did well. TRAVERS himself had also, some years before BLUNDELL's proposal considered the matter, related experiments on the subject, and laid down rules for the application of the ligature. But BENJAMIN BELL had mentioned this question even long before TRAVERS (*b*)].

1312. The *treatment* of retroversion of the womb consists in emptying the bladder and *rectum*, and on the restoration of the natural position of the womb.

(*a*) This case is cited in the first volume of this work, p. 476.
(*b*) Ibid., p. 468.

1313. Emptying the bladder is effected by the introduction of the catheter, which is rendered easy if with two fingers of the one hand, that part of the *vagina*, opposite the pubic *symphysis*, be smoothed and pushed upwards, or if its more elevated position forbid this, if it be merely pressed backwards. This manipulation is not without advantages even if the entrance of the *urethra* be so much drawn inwards, that it cannot be seen, or if any other obstacle to the use of the catheter exist (*a*). When drawing off the urine is completely impossible, puncturing the bladder above the *pubes* has been proposed (*b*).

Emptying the *rectum* is to be attempted with clysters (which can often only be done with difficulty) of decoction of barley and grass roots, with the addition of salt. Experience shows that in many cases, after this previous treatment, the retroverted womb of itself recovers its position (*c*). Hence by many, the replacement is considered unnecessary, and the distentions of the bladder and *rectum* held as the special cause of the retroversion. If inflammatory symptoms be also present, they must be attacked with suitable treatment.

1314. The modes of proceeding for the replacement of the retroverted womb are very various. The patient being placed on her knees and elbows, the base of the womb is to be pressed forwards and upwards towards the navel, with two fingers introduced into the *rectum* (*d*); which manœuvre may perhaps be assisted by two fingers passed into the *vagina*, and attempting to draw down the mouth of the womb. Some recommend the replacement to be effected by the fingers (*e*) introduced into the *vagina*, and in difficult cases, even the whole hand (1). The difficulties which have occurred in certain cases have led to the use of elevating instruments (*f*), to the proposal of puncturing the womb (*g*) (2), of cutting through the pubic *symphysis* (*h*), and of opening the belly (*i*).

(1) Bellanger (*k*) advises, when, on account of the elevated and forward direction of the neck of the womb, it is not possible to employ the fingers through the *vagina*, to introduce a flattened catheter into the bladder, and therewith to bring down the neck of the womb, whilst with the fingers in the *rectum*, its base is lifted upwards. This object was effected in a case where attempts at replacement had been vainly made in different ways. See also Lallemand (*l*).

(2) Puncturing the base of the womb through the hind wall of the *vagina* has been successfully performed by Journel of Rouen. Baynham (*m*) has performed it successfully, by a curved trocar passed through the *rectum* into the most projecting part of the swelling.

Halpin (*n*) effects the replacement, by inflating a bladder introduced into the *vagina* in the following manner. "I attached," says he, "a small recent bladder to

(*a*) Naegele and Schmitt, above cited.

(*b*) Cheston; in Medical Communications, vol. ii. p. 6.

(*c*) Vermandois; in Journal de Médecine, vol. lxxxviii.—Croft; in London Medical Journal, vol. xi.—Denman, T., Introduction to the Practice of Midwifery. London, 1801.

(*d*) Hunter, W., Saxtorph, Richter, and others.

(*e*) Lohmier and Naegele, above cited.

(*f*) Salzb. med.-chirurg. Zeitung, 1791. vol. i. No. 1.—Osiander, above cited.—Richter, G. M., Synopseis praxeos medico-obstetricæ, Mosq. 1810, p. 69.—Schmitt, above cited.

(*g*) Hunter, Wm, above cited.—Bellanger, above cited, p. 235.

(*h*) Richter; in Chirurg. Bibliothek, vol. vii. p. 729.

(i) Callisen, Systema chirurg. hod., vol. ii. p. 670.—Fiedler, in Rust's Magazin, vol. ii. p. 243.

(*k*) Mémoire sur la Rétroversion de l'Uterus; in Revue Médicale, 1824, Feb. p. 229.

(*l*) Ibid., May, 1824, p. 191.

(*m*) Edinburgh Med. and Surg. Journal, vol. xxiii. p. 256.

(*n*) Dublin Journal, vol. xvii. 1840. No. 49.

the tube of a stomach-pump, with an air-tight piston, and, having immersed it a few moments in warm water, to bring it to the heat of the body, I introduced it, empty, into the *vagina*, between the *fundus* of the *uterus* and the *rectum*. Retaining it within the *vagina*, by holding my hands firmly across the orifice, it was then slowly and steadily inflated. After a time she complained of a sense of tension or bursting, but no pain. We then ceased throwing air into the bladder, allowing what was in already to remain, keeping up as it did a steady, equal, well-directed pressure on the tumour. After the expiration of five minutes, we threw more air into the bladder, when the patient exclaimed, slowly, "Oh! now you are forcing something up to my stomach." I retained the bladder some time longer in its situation; and then, previous to withdrawing it, permitting the escape of some air, I introduced my finger, and had the satisfaction of finding that the tumour was no longer in the *pelvis*, and that the *os uteri* lay within reach of my finger, pointing downwards and backwards. * * * The retroversion having been rectified, I would introduce, as a pessary, a gum elastic bag, constructed on this principle, and inflate it to a proper state of distention." (p. 76.)

1315. If the fitness of these different modes of treatment be compared, the preference must, from the result of experience, be given over all other to the replacement through the *vagina*, as a far greater number of successful cases to have been ascribed it than to that by the *rectum*, which has been often unsuccessfully attempted, even with the whole hand, and with the employment of great force (*a*). As to the more heroic proposals for realizing the replacement, none indeed, except puncture of the bladder, is permissible, as in the cases where, after emptying the *rectum* and bladder, the symptoms are not diminished, and the proposed manipulation is insufficient, such fixing of the womb in its unnatural position may occur, that the replacement is impossible in any way, as HUNTER found on dissection of a person who died from this disease (*b*).

1316. In reference to the retroversion of the womb in women not pregnant, these rules apply, which have been given for the removal of the symptoms caused by the retention of urine and stools. As to the replacement, SCHWEIGHAEUSER considers it unnecessary, in which opinion SCHMITT also concurs, as by emptying the bladder with the catheter, and the intestinal canal with opening clysters, and the previous use of neutral salts, with carefully observed position on the side, the rump being raised, and the upper part of the body bent down, nearly always the effect is produced, and the womb gradually resumes its natural position, whilst also the swelling gradually subsides. This may be assisted, if with two fingers introduced daily into the *vagina*, the base of the womb be raised gradually but carefully. If the symptoms be inflammatory, merely mild remedies, emulsions of linseed or almond oil, fresh castor oil, lukewarm bathing, steaming, by means of a sponge laid on the generative organs, relaxing poultices upon the belly, and even general and local blood-letting, and copiously rubbing in mercurial ointment on the insides of the thighs. When the most pressing symptoms have been removed or lessened, then the replacement is to be especially attended to. Only when retroversion of the womb exists without any appearance of acute inflammation, may the replacement be at once attempted, but it

(*a*) VERMANDOIS, above cited.

(*b*) Einige medicinische und chirurgische Beobachtungen u. Heilmethoden. Aus d. Engl. gesammelt und mit vielen Zusätzen herausgegeben von K. G. KUHN. Leipz., 1784, vol. i.

must not be too long continued. As to the manipulation of the replacement, all that has been said heretofore applies.

1317. When the womb is returned to its place, it has rarely a disposition to be displaced anew, and the continued position on the side, is sufficient to prevent it. And besides as the womb enlarges during pregnancy, its retroversion is no longer possible. If there be a special disposition to retroversion, a round or oval pessary, with a pretty large aperture, or a sufficiently large piece of sponge introduced into the *vagina* fastened with a T-bandage, will prevent it. This applies also after the and replacement of the unimpregnated womb. The patient should very carefully avoid keeping on her back (*a*).

["In some few instances," says RIGBY, "the displacement has been permanently removed by once rectifying the position of the *uterus* with the uterine sound; but this favourable result is rather the exception than the rule, and some mechanical means is therefore required to retain the *uterus in situ*. The supporter used by Professor SIMPSON is excellently adapted to this object, and has answered well. It consists of a pin the length of the uterine cavity, (two and a-half inches), fixed in a disc or button on which the *os uteri* can rest, connected with, and kept in proper position by a little frame resting on the *mons Veneris*, which is fixed and properly adjusted by tapes. Another and equally ingenious mode of supporting the *uterus* he has obtained by means of a species of pessary, to which he has fixed the pin by a spring hinge, like that of a knife-blade. I have never tried this last, but to the other I can bear most favourable testimony, having applied it in a considerable number of cases with which I propose to illustrate this subject. I have lately altered the form of the pin which is passed into the *uterus*, making it flat, instead of round, and broader, so as to adapt it more exactly to the shape of the cavity. The pressure which it exerts on the internal surface of the *uterus* is thus more equable, and over a large space, and consequently does not produce so much irritation, which, especially at the catamenial periods, is occasionally troublesome, producing also a profuse discharge, and for a longer period than usual. To obviate the chemical action which takes place in an instrument made of German silver, I have had this portion of it made of ivory, at the suggestion of my friend Professor RETZIUS, of Stockholm, to whom I showed it, and in two cases it has been worn with much more comfort than with the ordinary pin; the objection, however, to the chemical action on the uterine secretion upon the German silver Professor SIMPSON had already remedied by electrotyping it with gold.

"The length of time during which these instruments require to be worn varies a good deal, and I have reason to believe that in cases where the displacement has returned, it has been owing to my having removed the support too soon. I believe that a month is the minimum period, and that in most instances our chances of success will be much greater if the period be extended to two months, or even longer." (pp. 125, 26.)]

1318. The *Antroversion of the Womb* is more rare than its retroversion, and occurs in both the impregnated and unimpregnated state (1). In the former case it is consequent on violent exertion, on vomiting, on a false step, and so on, with violent pain in the region of the stomach and belly, febrile symptoms, and frequent urgency to void the urine. The region of the stomach is somewhat tender on pressure, the whole belly, full, puffed up, especially the hypogastric region. The stress upon the *pubes* is very troublesome; the forcing of the urine very painful; in which, however, but little is discharged, and only in drops; therewith usually is their great urgency to going to stool, with thin and small motions. A swelling as big as the fist, seems to lie in the depth, behind the pubic *symphysis;* it can, however, only slightly be felt. The drag

(*a*) HUNTER, WILLIAM; in Medical Observations and Enquiries, vol. iv.

upon the bladder becomes exceedingly severe, without a drop of urine being discharged, a violent attack of fever takes place, disposition to vomiting, and the hypogastric region will not bear the least touch; the distended urinary bladder may so cover the swelling of the womb that it can no longer be felt. On examining the *vagina*, its entrance is narrow; the finger more deeply introduced, strikes immediately behind the pubic *symphysis*, upon a semilobular swelling, which drops into the little *pelvis*, feels smooth, elastic, and soft, and somewhat tender. The vaginal part is either not at all felt, or only with difficulty, in the more free hinder space of the *pelvis* above, pressed against the *rectum* in the hollow of the rump-bone, and otherwise forming a continuation with the swelling, so that the finger cannot be carried round between the two. Neither the vaginal portion nor the swelling are moveable by pressure.

The symptoms of antroversion of the impregnated womb differ according to their degree, the period of its origin, and the sensibility of the patient. In the above described way as Hachmann (*a*) noted it in antroversion, occurring suddenly in the third month of pregnancy, from a false step. Baudelocque (*b*) mentions a case of antroversion in the second month of pregnancy after an emetic. Nolde (*c*).

[(1) Blundell seems to think antroversion of the womb scarcely to be a diseased condition. "It is said," he observes, "that sometimes a change of position may take place, in which the *fundus* comes forward, and the mouth recedes, and which altered position writers have denominated *antroversion* of the *uterus;* but the truth is, that the womb is almost anteverted, frequently the *fundus* is pushed down below the *symphyis pubis*. Repeatedly, in making examinations, have I perceived it in this position, between my fingers, so that, in my opinion, these anteversions of the *uterus* can scarcely be looked upon as extraordinary and morbid. I might say, with truth, that they are perfectly healthy." (p. 21).

John Burns (*d*) says:—"Of this accident I have never seen an instance during gestation, and from the nature of the case, it must be very rare; but I have met with it, from enlargement of the *fundus uteri*, in the unimpregnated state." (p. 260). Boivin and Dugès say they have had frequent occasion of observing, after parturition, a decided inclination of the *fundus uteri* forward, the condition of the womb being intermediate between obliquity and retroversion.

This form of displaced womb is mentioned also by Gray, of New York (*e*), as "a dislocation of the womb downward, and slightly backward, the *os tincæ* tending towards the *coccyx*. The ano-perinæal region of Velpeau, or the *perinæum posticum* of the older anatomists, from relaxation of the *levator* and *sphincter ani*, becomes enlarged, and the triangular space between the point of the *coccyx* and the tuberosities of the ischian bones, forms, in consequence, a broad deep *cul-de-sac*, into which the *uterus* sinks in the line of its own axis, and rests against the *anus* and *rectum*. This posterior dislocation of the womb often takes place in pregnancy, particularly during the first four months; but it also takes place under other circumstances, I have no doubt, and that much more frequently than is commonly supposed. * * * The posterior displacement will be readily recognised by examination *per anum*. The finger will have to pass very much more backward than usual to get around the *os tincæ*, which lies hard against the *rectum*, just above the *sphincter ani*, and is very perceptible to the feel of the surgeon. In passing the finger *per vaginam*, the neck of the womb is first encountered, occupying the situation of the *os uteri*. The *os uteri* is found lying against the *rectum*, its aspect being backward and downward toward the point of the *os coccygis*, will have to be carried back in a curved form to reach it. The space between the *os uteri* and the posterior termination of the *vagina* appears much larger than natural." (pp. 221, 22.)]

(*a*) Einige Fälle von krankhafter Lageveränderung der Gebärmutter; in Hamb. Magazin der ausländ. Literatur. Nov., Dec., 1834, p. 352.

(*b*) L'Art des Accouchemens, p. 255.

(*c*) Beiträge, p. 220.

(*d*) Principles of Midwifery.

(*e*) On External Pressure in Prolapsus Uteri; in London Med. Gaz., vol. i. New Series, 1838–9.

1319. In *treating* antroversion of the pregnant womb, if the swelling be firm and immoveable, blood-letting, clysters (of an infusion of *belladonna*, according to HACHMANN) should be first employed, and the urine drawn off with the catheter. If the swelling be thereby rendered more moveable, or if it be moveable from the beginning, and unconnected with any particular symptoms, its replacement is to be attempted. The patient must be placed on her back, with the *pelvis* properly raised, the four fingers of the right hand being passed into the *vagina* are carried up to the deepest lying part of the swelling, and this is to be forced by a gradually increased pressure upwards, and in its slow yielding, somewhat backwards, whilst the left hand fixes the hypogastric region immediately above the pubic *symphysis*. In HACHMANN's case, very considerable, and for the patient, extremely painful force was employed, in order to lift the swelling out of the little *pelvis*. When this was effected, and the mouth of the womb removed from the rump-bone into the axis of the *pelvis*, the hand was withdrawn, and the pain ceased as by enchantment. Continuance on the back for some time is sufficient to prevent the recurrence of the displacement.

[BOIVIN and DUGES mention a case in which the *fundus uteri* inclined forwards, lower down than the *cervix*, and in which reduction seemed impracticable; yet, nature alone, during the progress of gestation accomplished the cure.

GODFREY, of Rennes, relates (*a*) two instances in which the natural position of the womb was restored simply by position. The first case he was unable to see; but directed that the woman should be put on the side of the bed, with her head and hands on the floor, and with the front of the thighs and legs only resting on the bed. In this position, he says, that the intestines, being drawn towards the diaphragm, the *pelvis* is emptied, and the womb, being no longer pressed on, resumes its natural position. After the patient had been in this posture fifteen minutes, all pain ceased. In the second case the woman was thirty-three years of age, had been pregnant between three and a-half and four months of her first child. She was attacked with weight in the *pelvis*, and frequent disposition to make water. Nothing having been done, excepting that she went to bed, and the symptoms continuing next day, an examination was made, and the neck of the womb was felt behind, and towards the curve of the *sacrum*, while the *fundus* was in front and behind the *os pubis*, the bladder not being very full, the catheter was not passed, but she was placed in the position just mentioned, upon the side of the bed, for twenty minutes. The feeling of weight in the *pelvis* diminished, and the desire to void the urine ceased.]

1320. The antroversion of the womb in its unimpregnated state, occurs either suddenly or slowly. In the former case, it produces violent pain, fever, great difficulty in voiding the urine and stools; in the latter, the difficulty of passing the urine and stools is less. The patient has, when she walks, the sensation as if a hard body fell upon the bladder, causing urgency to void the urine, which body again falls back when the patient lies on her back. Thence the possibility of confounding this condition with that of a stone in the bladder (*b*). Oftentimes there arise hæmorrhoidal affections, severe pain in the belly, suppressed or too frequent menstruation, and the whites; conception may be prevented. In examination with the fingers through the *vagina*, the base of the womb is found in front above the share-bones, its mouth situated opposite the rump-bone, and frequently, so high that it can scarcely be reached. SIEBOLD (*c*) has found the vaginal part connected with the *rectum*.

(*a*) Annals d'Obstétrique des Maladies des Femmes et des Enfans, Jan. 1842; and London and Edinburgh Monthly Journal of Medical Science, vol. for 1842, p. 313.

(*b*) Journal de Médecine, vol. xi. p. 269.

(*c*) Handbuch zur Erkenntniss und Heilung der Frauenzimmerkrankheiten. Second Edit. Frankfurt, 1821. vol. i. p. 737.

1321. The *causes* of antroversion of the womb are much inclined *pelvis*, loose connexion of the womb with the bladder, high position of Douglas's folds, too early getting up after delivery, continual costiveness, organic changes in the base of the womb, and bodily exertion of various kinds.

1322. The restoration of the natural position of the womb is easy. With two fingers introduced into the *vagina*, it is to be attempted to bring down the mouth of the womb, whilst with the other hand above the share-bones, the base of the womb is to be pressed backwards and upwards. The patient must continue a long while upon her back, a bandage should be applied round the belly, close above the *pubes*, and if this be insufficient to keep the womb in its place, it must be supported with a ring pessary. If the vaginal portion be adherent, it may be divided with the knife, and its reunion prevented, by a sponge put in it for a long while (*a*).

["The pessary in this case," says Gray, "does no good whatever; it is thrust into the ano-perinæal region, already rendered a sac by relaxation, and by the presence of the dislodged womb, and there, as a really foreign body, excites the same sensation, and keeps up the same irritation and discharges which the womb had done, and generally, as may readily be supposed, the latter are of a very aggravated character; whereas the new instrument of Dr. Hull, (his utero-abdominal supporter,) by pressing the ano-perinæal region upward and inward, directly opposes the descent of the womb, and, at the same time, diminishes the capacity of this region, whilst the hypogastric support of the apparatus prevents the descent of the abdominal *viscera* into the pelvis." (p. 222.)]

E.—OF CURVATURES.

1323. *Curvatures* (*Curvaturæ*, Lat; *Verkrümmungen*, Germ.; *Courbures*, Fr.) are remarkable deviations of certain parts of our body from their natural direction, depending either on an actual bending in the continuity of the bones, or on their bending and distortion in the neighbouring parts, that is, in the joints.

1324. Curvatures are either vices of the primary formation and congenital; or they arise later, and are ordinarily developed without pain. The bones are not divided as in fracture, nor completely displaced at their joints as in dislocation. Only in a great degree of curvature, if the joints be also distorted, deviations gradually occur in the joint-surfaces of the displaced bones; just as in long continuance of the ailment, single bones are differently changed in their form, diminished by absorption, or united by *callus*.

1325. The erect posture of our body, and of the several organs, depends on the, *equal antagonizing operation of the muscles*, and on the *firmness of the bones*. The causes of their curvature are therefore *disturbed abolished antagonism of the muscles*, or *changes in the structure of the bones, whereby they lose their proper degree of firmness*.

1326. The antagonism of muscles is disturbed when either one part

(*a*) Kyle, Beobachtungen über Antroversio Uteri in nichtschwangeren Zustande; in von Siebold's Journal, vol. xvii. pt. i.

possesses an absolute excess of activity above the other, or when one part is so weakened, that it opposes no obstacle to the natural activity of the other. This may be effected by palsy, wounds, weakness of the muscles, continued rest of certain muscles, tonic spasm, ordinary exertion of certain parts, especially in particular positions, by which they are wearied especially in children still under development, by diseased changes in the muscles, as from gout, rheumatism, inflammation, ulceration, ossification, and so on. The activity of the flexor muscles naturally, especially in the *fœtus*, exceeds that of the extensors; hence also the greater number of congenital and original curvatures arise in the course of the flexors.

1327. The muscles which produce the curvature, suffer always a more or less considerable degree of contraction and shortening, so that they are capable only of little extension, or of none at all. In long continuance of this condition, various changes occur in the tissue of the muscles, they lose their fulness, become thinner, even cord-like, and at last are converted into a fibro-cellular, or fatty mass (1). Whatever be the causes which have produced the contraction of the muscles, these changes are always the same, and their common origin lies in the *continual rest*, in which such muscles are found. Muscles, and, through them, their tendons and *aponeuroses*, must be kept in their constant and proper motion and activity if their vitality and organization is to remain natural, and a harmonious relation to exist between the voluntary influence which depends on the brain and the irritability which originates in the spinal marrow. If the activity of a muscle be damaged by one of the above-mentioned causes, and the muscle be kept in constant rest, it gradually diminishes, and at last all voluntary influence over it is lost, and its irritability and tone increase correspondently; by longer continuance of this condition, the tissue shrivels up, becomes unyielding, is to a certain degree atrophied, according to the same law that the intestine below an artificial *anus*, or a vessel which no longer contains blood, shrivels up, grows together, and at last wastes away. The rest of a muscle, when its contraction has once taken place, is therefore continual, because all voluntary motions which the patient attempts with the curved part, can occur only in such one way and direction, that thereby no outstretching and extension, but only a greater shortening of the contracted muscles, can be effected. A close observation of the motions in curvatures, especially in the feet, shows this remarkably. It is clear, that under such circumstances, the nervous influence and nourishment must be diminished in the muscles, and the diminution of the nervous influence may increase up to actual palsy, although the contraction of the muscle continue. In this way also is explained the reason why in palsy, which originates from the brain, and loss or diminution of the voluntary influence depending on the muscles, the muscles are contracted, whilst in palsy, proceeding from the spinal marrow, they are lax and atonic. Spasm, produced by topical causes in the muscle itself, or by reflected activity of the spinal marrow, may be the first origin of contraction of the muscles, and of the curvature thereon depending; but the continued contraction of the muscle is not to be considered as a consequence of *continual* spasm, but of the sustained rest of the muscle, and its diminished voluntary action. The

same is observed in inflammation, and in all painful affections when certain muscles are kept in a continued quiet state. The most direct proof of this opinion is given by the bearings of the limb, if its natural direction be restored, in which case the recapability of motion, and the voluntary influence again gradually returns, and in the same measure, the nutrition of the muscles is increased, and their bulk enlarged, as I have especially observed, after the cure of curvatures by cutting the tendons.

(1) Guerin (*a*), who, in all contractions assumes a convulsive retraction of the muscles derived from the brain, whence ensues an indisposition to the growth of the skeleton, change of bulk and fibrous degeneration disturbed functions, supposes that muscles, which by other causes have been relaxed and shortened, do not exhibit the hardness and fibrous degeneration, as the former contract, but these are disposed to fatty degeneration.

1328. The natural connexion of bones may be disturbed by rickets, *osteomalacy*, scrofula, venereal, cachectic diseases, inflammation, suppuration, and so on. The softened bones are then exposed to the action of the muscles, and drawn according to the direction of the force acting upon them; or the weight of the body is sufficient to curve them; from which latter cause such curvings most frequently happen in the trunk and the bones of the lower extremities.

Frequently do the just-described causes occur at the same time, and in inverse proportions; the curvings, however, most commonly arise out of unnatural activity of the muscles.

1329. As to the *prognosis* of curvatures, all depends on their extent and how long the curvature has existed, and in how far the causes originating them may be got rid of. The younger the subject, and the less the curvature, so much the more favourable is the *prognosis*. In older subjects, and long-continued curvature, the treatment is always protracted, and in many cases, often only an aggravation of the disease can be prevented. When in curvatures at the joints, organic changes of the bones, destruction, *anchylosis*, and so on exist, the disease is incurable. Curvatures depending on muscular contraction, generally allow a better *prognosis* than those from diminished connexion of the bones. But if the muscles have become so wasted by long-continued curvature that their lengthening can be of no use, which is however difficult to determine, they are incurable.

1330. The *cure* of curvatures depends on the removal of the causes, and the restoration of the natural direction of the curved parts. When the firmness of the bone is altered, such remedies must be employed as therapeutics have pointed out as fitting to the special diseases which cause the changed coherence of bones, together with the simultaneous employment of suitable contrivances and apparatus by which the straight direction may be restored. Mere mechanical treatment is entirely useless if the diseased state of the bony system be not removed.

1331. If the origin of the curvature depend on the disturbed equilibrium of the muscular activity, the treatment must be directed according to the different causes. Usually rubbing suppling remedies into the shortened and contracted muscles, and spirituous rubbings into the stretched and lengthened muscles are recommended; but from these remedies there is really less benefit than from the motion and extension

(*a*) Gazette Médicale, April, 1838. No. 14.

of the contracted muscles which arises from their application. As with long-continued curving, the nervous influence is diminished in the contracted and shortened muscles, and a lessened activity of the nerves of motion is accompanied with a certain degree of curvature and wasting, so may sharp irritants, vesicatories, and even moxas, act beneficially in quickening and increasing the vitality, which remedies are especially indicated in actual palsy. In reference to this object, kneading, rubbing, and stretching the muscles, are very serviceable; but above all, suitable *gymnastics*, (with careful regard to the somewhat necessary improvement of the general state of health,) as first introduced by Delpech (*a*). Slighter degrees of curvature may be got rid of by these remedies alone; but if the curvature be greater, they must be accompanied with the application of suitable machines and apparatus.

1332. If with long-continued curvature from shortening of the muscles, such change of their tissue have been produced, that by the treatment proposed it can be removed either with extreme difficulty, or not at all, the subcutaneous cutting through the shortened muscles, or their tendons and *aponeuroses*, (*myotomia*, *tenotomia*,) if possible, is the most proper remedy. Between the two ends of the divided tendon which retract, the upper more strongly than the lower, blood is effused, which coagulates and unites with the whole internal surface of the wound, and especially with the ends of the tendon. Exudations of plastic lymph soon occur, particularly from the ends of the tendon, presenting whitish thread-like streaks, running from one to the other, and gradually from mass resembling fibrous tissue, which is capable of due extension, and sufficiently strong to answer the function of the muscles. This operation is therefore especially indicated under the above-mentioned conditions, if there do not at the same time exist such considerable changes in the bones, and from the long continuance of the disease, such a degree of wasting in the muscles, and the whole limb, that by the mere lengthening of the muscles, the restoration of their natural position cannot be effected, which however it is often difficult previously to determine, and when the causes giving rise to the contraction, gout for instance, still exist. The various objections made to this operation, the repeated shortening of the tendons by the gradual contraction of the newly formed intersubstance, as observed in every scar, as well as the injury to the natural direction and motions of the part from excessive activity of the antagonizing muscles, are without foundation, and contradicted by the large experience of modern times. The pain and wound are in this operation usually slight, and no particular symptoms occur. If in rare cases such be observed, as violent inflammation, with destruction of the cellular tissue, exfoliation of tendons, and so on, they must be ascribed rather to the peculiar relations of the constitution of the patient, or to the proceedings in the operation and the after-treatment, than to the operation itself. The straightening of the part, and the stretching of the tendons by proper apparatus, is most properly commenced some days after they have been cut through, when the external wound is healed, to which time a light bandage covering the part keeps it in a proper position. The

(*a*) De l'Orthomorphie par rapport à l'espèce humaine, &c. 1828. Paris and Montpellier, 2 vols. 8vo. atlas, 4to.

employment of extension immediately after the division is improper, as thereby the two ends of the tendon are too far separated, and bad symptoms may be brought on. Too late use of extension when the intermediate substance has a trained firmness, renders the lengthening difficult, and even impossible.

The division of shortened muscles and tendons, early employed on the *m. sterno-cleido mastoideus* in wry neck, (Roonhuysen, Meeckren, Ten Haaf, and others,) and then forgotten; again revived by Sharp, by Tilesius, and Sartorius, upon the Achilles' tendon in club-foot, by Michaelis extended to other tendons also, were subsequently little thought of, and only employed in certain cases of contraction, by Dupuytren and Dieffenbach in wry neck, and by Delpech employed in horse-foot as a *subcutaneous* division. But more recently, it has been first brought into practice as a subcutaneous division by the large experience and observation of Stromeyer; and by Dieffenbach, Stöss, Duval, Scoutetten, Bouvier, Pauli, myself, and many others has it been variously practised and extended to different muscles, as more attention has been paid to the special treatment of curvatures. The mode of cure of tendons thus divided, Delpech formerly, and in modern times more especially, von Ammon (*a*,) Duval, Bouvier, and others (*b*,) have explained by experiments on brutes.

I.—OF WRY NECK.

(*Caput obstipum*, *Cervix obstipa*, *Obstipas*, *Torticollis*, Lat.; *schiefe Hals*, Germ. *Torticolis*, *Obstipité*, Fr.)

Mauchart, Dissert. sistens caput obstipum. Tubing., 1737.

Rettig, H. X., Dissert. sistens caput obstipum. Budæ, 1783, 8vo.

Gruve, G., Dissert. de capite obstipo. Traj. ad Rh., 1786. 4to.

Clossius, C. F., Ueber die Krankheiten der Knochen. Tubing., 1798, p. 254.

Richter, Anfangsgründe, vol. iv. p. 256.

Jörg, J. C. G., Ueber die Verkrümmungen des menschlichen Körpersund eine rationelle und sichere Heilart der selben. Leipz., 1816; with six plates.

Stromeyer, L., Beiträge zur operativen Orthopäedic. Hannover, 1838.

Phillips, Benjamin, Lectures on Surgery; in London Medical Gazette, vol. xxvi. p. 244. 1840.

Dieffenbach, Die Durchschneidung der Sehnen und Muskeln. Berl., 1841, p. 17; with twenty lithographed plates.

Phillips, Ch., M. D., De la Ténotomie sous-cutanée, ou des Opérations qui se pratiquent pour la Guérison des Pieds-bots, Torticollis, &c. Paris, 1841. 8vo.

Bonnet, A., Traité des Sections tendineuses et musculaires, etc. Paris, et Lyons, 1841, p. 581.

1333. *Wry Neck* consists in such distortion of the neck, that the head is inclined forwards, aside, downwards, frequently even to the shoulder; and the face turned more or less to the opposite side, and at the same time forwards and upwards; the chin raised proportionally higher, as the head is in a greater degree drawn down. The patient can, under these circumstances, move the head either not at all, or only in a slight degree; often can it be done only by the assistance of another, and frequently it is not in any way possible. This disease may originate in an irregular activity of the muscles of the neck, especially of the *m. sterno-mastoideus*, in a large unsightly scar, or in a distortion of the neck itself. When long continued, there is always dissimilarity in the two sides of the face.

(*a*) De physiologiæ tenatomiæ experimentis illustrat. Dresden, 1837.

(*b*) Pirogoff, N., Ueber die Durchschneidung der Achilles'sehne als Operativ-orthopädisches Heilmittel. Dorpat, 1843; with seven copper plates. 4to.

Distortion of the neck, as consequent on inflammation and suppuration of the joint-surfaces of the *vertebræ* of the neck, has been already considered (*par.* 263.)

1334. The most frequent *cause* of wry neck is unnatural muscular activity. It is either congenital and depends on irregular position of the child in the womb (1); or it arises from violence during delivery, which affects the *m. sterno-mastoideus* (2); or it comes on later from the habit always hanging the head to one side, especially in children, if they be constantly carried on one arm; if, on account of the continuance of any pain in the neck it be inclined to one side (3), by spasm and organic change in the structure of the *m. sterno-mastoideus*. If the cause lie in the unnatural activity of this muscle, it is always found, on the side to which the head is drawn, stretched like a cord, hard and unyielding; in attempting to bring the head into its proper position, the muscle becomes more tense and prevents it (4). It is really only the *m. sterno-mastoideus* which is primarily shortened, and most commonly on the right side; rarely, also, the *m. cleido-mastoideus* and *cucullus;* the *m. platysma myoides*, may also be shortened. Frequently is the *m. sterno-mastoideus* of one side palsied, and the natural contraction of that of the other draws down the head. In this case the dissimilarity of the two sides of the face and the distortion of the features are not so great, as in wry neck from unnatural muscular contraction; the head is drawn only towards the shoulder, but the chin is not raised (5). That the cause of the evil is in the bones is known, when no change can be observed in the muscles, and the general symptoms of softening of bone be present. The head is also usually more moveable than in the former cases (6).

(1) Stromeyer (*a*) remarks on the coincidence of congenital shortening of the *m. sterno-mastoideus* with the irregular position of the child, so that a breech-birth takes place, or turning is necessary.

(2) After difficult delivery, and after the application of forceps, a little round bluish doughy swelling above the collar-bone, corresponding to the course of the *m. sterno-mastoideus*, is frequently observed, which, after subsiding, leaves to be felt a hard thick substance, depending on partial or complete tearing of the muscle. (Stromeyer, Dieffenbach.)

(3) I have noticed a wry neck which arose from the application of a blister behind the ear, and in a short time became considerable.

[(4) Although generally in wry neck the muscle or muscles causing it are felt contracted like a cord, yet this is not always so. Syme (*b*) mentions an instance of this kind in a boy with lateral curvature. "Observing that his head inclined to one side, I examined the sterno-mastoid, and found it, not tense and rigid as I had expected, but soft and yielding. I perceived, however, that when an attempt was made to raise the head, the muscle resisted and became tense, and therefore concluded that it was the seat of the evil." (p. 273.)

(5) Brodie mentions (*c*) a remarkable example of wry neck alternating with insanity, among the instances he gives of persons "labouring under some disease in the brain, in whom a particular symptom, referred, perhaps, to a distant part of the body, is so severe, or so distressing, that they regard it as the original disease. * * * In many of these cases, the cause of irritation seems to operate always on the same part of the *sensorium*, and there is little or no variety in the local indications by which it is rendered manifest. At other times it has no determined seat: it may affect at first one portion of the brain to which a certain function belongs, and then

(*a*) Above cited, p. 131.

(*b*) On Lateral Curvature of the Spine and the cases in which it may be remedied by operation; in London and Edinburgh Monthly Journal of Medical Science, vol. iii. 1843.

(*c*) Lectures illustrative of certain Local Nervous Affections. London, 1837. 8vo.

it may affect another portion, whose function is entirely different, and the symptoms vary accordingly. * * * A lady became affected with a spasmodic affection of the sterno-cleido mastoid muscle, producing what is commonly called a spasmodic wry neck. This symptom continued unabated for a year, and then suddenly left her; but as the spasm in the muscle ceased, she fell into a state of mental depression, amounting to insanity; and in this she continued during the whole of the second year. At the end of this period she recovered of the disordered condition of her mind, and the spasm of the muscle returned, continuing from that period up to the time of my being consulted three or four years afterwards." (pp. 7, 8.)

(6) Syme remarks:—"It may be well to warn against mistaking for wry neck depending upon muscular contraction, the distorted position of the head which proceeds from *caries* between the *occiput* and *atlas*. The latter disease, like the former, usually occurs in young persons, presents to a careless observer similar symptoms, and if confounded with it, leads to a treatment not only useless, but extremely dangerous. (p. 273.)]

1335. The *prognosis* in wry neck depends especially on the cause and duration of the ailment. In young persons, if the cause be in the muscles, the *prognosis* is always favourable; and this applies also, under similar conditions, from curvature of the bones. But, if by long continuance of the ailment, the *vertebræ* of the neck have undergone a change of form, or have become united by adhesion, which may be ascertained by careful examination with the fingers, and simultaneous movement of the neck, the ailment is incurable.

1336. The *cure* of wry neck varies according to its causes. If dependent on unnatural activity of the muscles, it must be attempted to relax the contracted *m. sterno-mastoideus*, by rubbing in suppling remedies, as well as by exciting contraction of the relaxed muscles on the other side by volatile, strengthening rubbings of aromatic spirit, arrack, rum, and the like, and even by the employment of electricity or galvanism. After rubbing, attempts must be made to stretch the shortened *m. sterno mastoideus*, and at the same time, to bring the head straight, which manipulation must be continued for a quarter or half an hour, during the day, till the head have been brought to its natural place, and even bend somewhat to the opposite side. The patient must also be permitted frequently to turn his head aside.

For the purpose of keeping the head straight, various apparatus and machines have been proposed, for instance that of Le Vacher, with alteration by Delacroix (*a*), Kohler's cap, and others. Jörg's (*b*), apparatus, however, seems to answer the purpose best; it consists of a head-band and stays, on the front of which is attached a spring, from whence a strap carried round the neck and fastened behind the ears in the region of the mastoid process, is fastened to the head-band. This apparatus may be worn day and night, and the manipulation may be also continued. As the head, though thereby straightened, is still however held somewhat forward, towards the end of the cure the band must be carried beneath the arm of the ailing side, go up through a ring, and be fastened at the place mentioned. The apparatus must be worn (latterly only for some hours in the day) till the antagonism between the two sterno-mastoids is perfectly restored. Delpech (*c*) recommends a stretching apparatus, when in bed, and drawing the head by means of a loop fastened to the head and to the side of the bed.

(*a*) Gerdy, P. N., Traité des Bandages et Appareils de Pansement. Paris, 1826. 8vo. et atlas 4to.—von Froriep's Kupfertafeln, pl. clxix.

(*b*) Above cited, pl. ii.

(*c*) Orthomorphie, vol. ii. p. 209.

1337. But if, when the disease have already existed for some time in a certain state, this treatment have no result, it is extremely irksome and tedious; the division of the *m. sterno-mastoideus* then leads more speedily to the object, and is, indeed especially, the only cure in all cases where, by the continuance of the ailment, organic changes occur in the structure of the *m. sterno-mastoideus*, which render all lengthening by the proposed treatment impossible. The reasons which have been brought against this operation, rejected unconditionally by JÖRG, are quite untenable; the operation is free from danger, accompanied with little pain, and the result is quick, even after the disease has existed twelve or sixteen years, or even longer.

ROONHUYSEN (*a*) and TEN HAAF (*b*) cut through the *m. sterno-mastoideus* from without inwards, with a fold of the skin raised. VON MEECKREN (*c*) effected the division with a pair of scissors; MINNIUS (*d*) first destroyed the skin over the muscle with caustic, and then cut it through with scissors. SHARP (*e*) made a transverse cut through the skin, and divided the muscle from within outwards with a knife introduced behind it. This treatment was recommended by all the later writers, till DUPUYTREN and DIEFFENBACH (*f*) proposed the subcutaneous division of the muscle, in which manner the operation has been performed with the most successful results, by many surgeons and by myself.

1338. The subcutaneous division of the *m. sterno-mastoideus* is performed in the following manner. The patient sitting on a stool, one assistant draws the head to the opposite side, and another pulls down the shoulder of the ailing side, in consequence of which the muscle projects strongly at its shortest part. The skin above it is then taken hold of with the thumb and fore-finger of the left hand, well drawn away from the parts beneath, and a *narrow, slightly convex, straight knife*, held flat, is to be thrust an inch or two above its lower insertion, through the skin, and carried close behind the muscle, to the other side beneath the skin, but without piercing the latter. The edge is then turned towards the muscle, and the thumb of the left hand being placed on the muscle, to fix it against the edge, the muscle is divided, without cutting the skin, in drawing out the knife. At the commencement of the division of the muscle, a dull and sometimes tolerably loud crack is heard, upon which the head is almost immediately drawn straight by the contraction of the *m. sterno-mastoideus* on the other side; but sometimes the old position is retained, and even more strongly. At the moment when the knife is drawn back, if pressure be made with the thumb upon the part divided, and no blood be poured out beneath the skin, a firm compress of lint is to be applied, and fastened with sticking plaster, and a bandage carried obliquely over the neck and breast. Two cloths carried round are sufficient to support the head; they do not, however, keep it straight, but leave it in its early oblique position.

The choice of place for dividing the *m. sterno-mastoideus* (fixed by LATTA at half an inch, and by DIEFFENBACH at two inches above its insertion) is indifferent, and

(*a*) Heilkuren. Nürnberg, 1674, vol. i. No. 22, 23.—BLASII, G., Observat. Med. rar. Amstelod., 1677, pl. ii. No. 1.

(*b*) Abhandlungen aus der Naturgeschichte, praktischen Arzneikunde und Chirurgie; aus den Schriften der Harlemer und anderer Holländischen Gesellschaften gesammelt. Leipzig, 1775, vol. i. p. 262.

(*c*) Wahre und wunderbare chirurgisch und geneeskünstige Anmerkungen. Nürnberg, 1675.

(*d*) TULPII, Observationes Medic.

(*e*) Treatise on the Operations of Surgery, London, 1740, chap. XXXV.

(*f*) RUST'S Handbuch der Chirurgie,—Art., *Caput obstipum.*

must be guided by where the muscle can be isolated safely; however, the deep division at the tendinous part is more preferable, because it is liable to less reaction than the division of the muscle.

I use a straight, narrow, *slightly* convex knife, because it acts more surely and correctly than a knife with a concave edge; and, like DIEFFENBACH, I make only one thrust, in which he uses a narrow sickle-shaped knife, much curved at its point. STROMEYER, who has frequently performed the division of the *m. sterno-mastoideus* from before backwards, employs for the purpose a narrow curved knife, with its convexity cutting, which he thrusts through a fold in the skin, an inch broad above the collar-bone, and by the entrance of the knife divides the muscle. For those cases where the muscle cannot be sufficiently isolated, he has proposed a peculiar forceps-like instrument (*a*).

1339. Ordinarily the division of the *m. sterno-mastoideus* is sufficient; but if the *m. cleido-mastoideus*, or a *cleido-mastoideus secundus*, (STROMEYER,) or the clavicular portion of the *m. cucullaris* be shortened, the division must be effected with a straight or convex narrow bistoury, or with STROMEYER's instrument, according to the rules given above.

1340. If the patient be kept quiet, in the horizontal posture in bed, and on antiphlogistic diet, generally no farther symptoms occur. After some days the external wound is healed. The muscle, at the place of its division, usually presents a slight swelling; frequently also a slight fluctuation of blood is felt in which case, according to DIEFFENBACH, sticking plaster should be applied anew somewhat tighter, in order to promote its absorption, which is usually effected in a few days. Applications of warm lead wash, and rubbing in warm oil to get rid of the last tension are generally superfluous. If *pus* be formed, it must be discharged by a puncture, and the wound treated simply. A pasteboard cravat of half the usual height, folded in a cloth, and applied on the side of the division is, according to DIEFFENBACH, more serviceable in preserving the straight posture of the head than all violent extension, on which point I, from experience, entirely agree with him.

STROMEYER (*b*) considers that only by a stretching apparatus (pl. vii.) are we in a position to obtain all the advantages of the operation which can be attained, because only in the horizontal posture can the muscles of the neck be completely extended, and it is only possible to stretch the head towards the diseased side for the purpose of giving the *m. sterno-mastoideus* its whole length, and enabling it again to extend itself. He therefore puts it as a question whether, in very bad cases, it be not advisable to begin the extension directly after the operation, in order to avoid a repetition of the division.

If after perfect replacement, the freest motion of the neck be again given, and complete similarity of the sides of the face obtained, yet is it observed in some cases, that at the moment when the muscular system is not in action, the head is somewhat disposed towards the ailing side, manifestly because there the *turgor vitalis* is less. STROMEYER does not know whether this be entirely lost in age. Spirituous rubbing seems to him to contribute somewhat to the diminution of this relaxation, but above all, the continued use of the stretching apparatus, some time after the subsidence of all resistance.

1341. If the cause of wry neck be spasm of the *m. sterno-cleido mastoideus*, in which case the ailment is always more or less painful, accompanied with radiation of the pain, according to the branchings of the nerves, and often alternating, it must be inquired whether or not any internal cause be in play, against which the treatment should be directed, and antispasmodics employed both internally and externally. But if the contraction have at once become permanent, in general all internal and

(*a*) Above cited, pl. viii. f. 1, 2. (*b*) Above cited, p. 130.

external treatment is fruitless, and cutting through the muscle is the only means whereby not merely the straight direction of the head is restored, but also the painful and spasmodic affections are removed.

Compare the interesting observations hereto belonging of Stromeyer (*a*) and Amussat (*b*).

A spasmodic affection of the *m. platysma myoides*, with radiation on the face and ear of the affected side, was perfectly cured by Gooch (*c*) by a transverse division of the muscle beneath the jaw, after he had laid it bare with a transverse incision of the skin across its breadth.

1342. If large scars be the cause of wry neck, their mere division is usually of little use, and the evil may thereby be even increased. The whole scar, together with the thickened and adhering cellular tissue must be removed, and where possible the quick union of the edges of the wound brought about. During and after the treatment, the head must be kept in a proper position. With slight superficial scars only, its straight direction may be often given to the head, by suppling remedies which are to be rubbed in, and by the bandages prescribed.

1343. If the cause of the wry neck be in a bending of the neck-*vertebræ*, and if it be unaccompanied with *anchylosis*, or change of structure, the above-mentioned apparatus must be used for the gradual straightening of the head.

II.—OF CURVATURES OF THE SPINAL COLUMN.

(*Incurvationes seu Distortiones Columnæ Vertebralis*, Lat.; *Verkrümmungen der Rückensäule*, Germ.; *Courbures de la Colonne vertébrale*, Fr.)

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(*a*) Above cited, p. 137. (*b*) Gazette Médicale, December, 1834, 829.
(*c*) Cases and Practical Remarks in Surgery, vol. ii. p. 83. Norwich, 1767.

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Ibid., Further Observations on the Lateral and Serpentine Curvature of the Spine, and on the Treatment of Contracted Limbs. London, 1825. 8vo.

Ibid., Engravings illustrative of a Work on the Nature and Treatment of the Distortions to which the Spine and the Bones of the Chest are subject. 1824. fol.

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[Mitchell, J. K., On Lateral Curvature of the Spine in North American Medical and Surgical Journal. Philadelphia, 1827.—g. w. n.]

1344. The spinal column may be curved at any one part, and according to the direction in which this occurs, are distinguished, *first*, the *lateral Curvature* (*Scoliosis*); *second*, the *posterior* (*Humpback*, *Buckel*, Germ.; *Gibbus*, *Cyphosis*); *third*, the *Anterior Curvature* (*Lordosis*). The spine never deviates according to either of its natural directions, but always in an opposite one. At the same time it is therewith more or less twisted, and this again in a contrary direction. It is evident that the intestines contained in the chest and belly, must consequently have their natural position variously altered, and only the successive origins of these curvatures render it comprehensible, how these intestines are often so considerably displaced, without great disturbance of their functions. The curvatures of the spine have no effect on the transverse diameter of the *pelvis*, if unfounded in general disease, especially rickets or *osteomalacy* (*a*).

This opinion, advanced by Meckel, and supported by numerous facts, which, in consequence of careful observation, I hold to be correct, has been denied by Jörg (*b*) and Choulart (*c*) in so far as they assume, without any general disease of the bones, a decided influence of the curvature of the spine upon the form of the *pelvis*, only that in general disease, or, if the curvature have existed from youth, it is more decided. According to their view, as the spinal column has four natural curves,

(*a*) Meckel, J. F., Handbuch der menschlichen Anatomie, vol. ii. p. 740.—Wenzel, above cited, p. 9.

(*b*) Above cited, p. 8–26.

(*c*) Above cited, p. 15.

(at the neck convex forwards, at the back convex backwards, at the loins convex forwards, and on the rump-bone convex backwards,) in all cases where the natural curve increases at any one spot, the other natural curves should also be increased; just as, on the contrary, when the curve takes place in the opposite direction, the other parts of the spine also have their natural curve assume a contrary direction; in consequence of which the rump-bone becomes more curved, or more flattened. In lateral curvature the *pelvis* is always narrowed obliquely by the inclination of the rump-bone toward the one or other side. See also on this subject Rokitansky (*a*).

1345. The *inclination of the spinal column to one side*, (*Scoliosis*,) produces at first a different condition of the shoulders, and one becomes higher than the other; the body is disposed towards the side opposite the curvature, the one side of the back is full, the other concave, and more hollow; and upon it, between the last false rib and the hip-bone, is observed a small fold of the tegument, which increases proportionally as the curvature of the spine increases. With such increased inclination toward the side, distortion of the spine also occurs; the spinous processes are twisted toward the side of the inclination. The whole trunk is gradually bent, the ribs follow the distortion of the spine, are flatter on their concave surface, but upon their convex hinder surface are more strongly arched, are very widely separated from each other, and broader, whence a projection backwards is produced. The breast-bone is mostly oblique, and drawn towards the concave side of the curvature. If the curvature be at the upper part of the spine, the position of the shoulder-blades is much changed. Curvatures at the lower part of the spine affect the carriage of the body less than at the upper. Lastly, curvatures are produced in opposite directions, in which case one is, as it were, equalized by the other. In the highest degree the direction of the bones of the *pelvis* is changed, the one hip-bone stands higher than the other, and, under the circumstances mentioned, (*par.* 1344,) the promontory of the rump-bone may project inwards towards the one or other side, and narrow the entrance of the *pelvis*.

The higher position of one shoulder is always present in *scoliosis*, but it occurs alone, and without simultaneous curving of the spinal column, as *high shoulder* (*Humerus elatus*). Raising up one shoulder, usually the right, by which the elevating muscles of the shoulder-blade become gradually stronger, is the result of bad habit; the lower angle of the blade-bone is raised higher than that of the other side; the hinder edge, however of the bone remains in the same position, and only after long continuance does the shoulder-blade project especially at its angle. If both shoulders be high, which occurs from bad carriage, as a consequence of corresponding straining of both arms, in bending forwards the head, in short-sighted and old persons, the back is considerably arched, and the head in the same proportion projecting. In a higher degree always, at the same time, some inclination of the spinal column occurs.

[The most common cause of a high shoulder is to be found in the abominable practice of undressing girl's necks, as low as the hanging on of their clothes will permit. Instead of the shoulder straps of their dress being as they should be, fairly above the root of the acromial processes, they often, indeed most commonly, either only skirt the extreme end of those processes, and rest on the rounded upper part of the deltoid muscles, or are actually far down on the arms; in consequence of which, the dress having little or no suspension on the shoulders, is constantly dropping, and the girl to save her clothes dropping down, or at least to keep them in place, is continually hitching up the shoulder from which the shoulder-strap most easily slips, and thus the elevating muscles becoming stronger on that side, pull the shoulder

(*a*) Beiträge zur Kenntniss der Rückgrathskrümmungen, und der mit denselben zusammentreffenden Abweichungen des Brustkorbes und Beckens; in Oester-Med. Jahrbüchern, vol. xxviii. pt. i. ii.

permanently up, and produce a very ugly appearance. But the mischief does not stop here, for though there be really no disease in the spine, yet this constant hitching up of the shoulder, causes the head and neck to be thrown to the other side, whilst the chest is drawn out to the same side, and thus a lateral curvature of the spine is produced, and a girl's figure spoiled, for the simple purpose of uncovering her neck and shoulders as far as possible, which, as well for decency, as for the preservation of the child's health, ought to be covered. Many parents have been thus the real cause of their daughter's distortion, if not of more serious consequences; and therefore, in growing girls who have the least disposition to slip their shoulder out of their dress, most especial care should be taken to prevent the possibility of keeping up this habit, by having the dress made so high, that it cannot slip down, and then the sensation of its slipping being lost, the child no longer continues to hitch up her shoulder, and by a little attention to her proper carriage, the mischief, if not of long standing, may be got rid of.—J. F. S.]

1346. The intestines of the chest and belly are variously displaced by the higher degrees of *scoliosis*, in consequence of which the circulation of the blood in the lungs is hindered, difficult respiration, narrow-chestedness, disturbance of the digestion, and so on, arise which thus explain the usually weakly form of the body in persons affected with such curvatures.

1347. In *Cyphosis* the spinous processes form a convex projection, and the bodies of the spinal column a curve, the concavity of which is forwards, and, as they drop together, the upper approach the lower. At first, the head of the patient inclines forwards; in the supine posture no change is observed, except after very considerable exertion. In the second degree, the inclination of the spine remains, and is always increasing; it projects into a blunt, and, subsequently into a sharp angle. If the *cyphosis* be in the *vertebræ* of the neck, breathing and swallowing are especially affected; if the *vertebræ* of the back be curved, the ribs are lengthened forwards, the breast-bone raised, and the transverse diameter of the chest lessened, from which difficulty of breathing ensues. By the dropping of the spine, the bowels are driven down into the *pelvis*, and frequently cause difficulties in digestion. The bodies of the *vertebræ* shrink in a high degree of the disease, and they may be fixed by *anchylosis* in their unnatural position. Inclinations in other directions may at the same time accompany *cyphosis*.

Only in the cases where the *cyphosis* depends on *caries* of the *vertebræ* (Pott's disease) does palsy of the limb occur.

1348. The *inclination forwards* is the most rare of all the curvatures of the spine. The *vertebræ* project forward in a convex arch, and the spinous processes are thereby approached together in a concave curve. Whence follows, that the *lordosis* can never attain so great an extent as the *cyphosis*, because the spinous processes touch. It occurs always in the *vertebræ* of the loins, and the inconveniences they excite are those of the pendant belly. It has been observed, but very rarely, in the *vertebræ* of the neck.

1349. What has been said upon the ætiology of curvature in general, applies also to that of the spine. There is either a disturbed antagonism of the muscles, or a diminished strength of the bones. The occasional causes which especially favour the various inclinations of the spine are:—

First. In *scoliosis*, careless carriage of the body in various employments, hanging on one side in writing, sitting, especially in the hand-work of

ladies, increased exertion of one side, the habit of doing every thing with one hand, constantly carrying children on one arm, which acts very prejudicially, as one hip-bone is always more raised and pressed than the other. The younger the patient is, the more prejudicially do the above-mentioned causes operate. If the cause of the curvature depend on unnatural activity of the muscles, they are more firm and contracted on the concave side of the curvature (which, in by far the greatest number of the cases, is the left;) if the cause of the curvature depend rather on an altered state of the bones, the difference of the muscles is not so remarkable (1).

Second. In *cyphosis* the cause, for the most part, is in the bones, and the weight of the body itself is sufficient to increase the bending backwards already existing in the *vertebræ* of the back, where the *cyphosis* most commonly occurs; often is there accompanying weakness of all the muscles, which should keep the spine erect, as is frequently the case in children and old persons.

Third. In *lordosis*, in their natural state, the external muscles of the loins are more powerful than the internal; whatever therefore increases the strength of the former, increases also the natural bending inwards of the *vertebræ* of the loins, as long standing with the upper part of the body bent back, great bending back of the upper part of the body in the usual carriage, bearing heavy burdens. *Lordosis* is therefore more frequent in men than in women.

(1) Stromeyer (*a*) supposes that *scoliosis* arises, if not in all, at least in most cases, from one-sided palsy of the inspiratory muscle, viz., the *m. serratus magnus*. The muscle, although still capable of voluntary motions, takes no part in those of breathing, which is especially observable if the motions of the *diaphragm* be restrained by pressure on the belly, and the external muscles of inspiration be excited to increased activity; as then the muscles of the palsied side remain quite quiet. This imperfect palsy is derived from the palsy of Bell's respiratory system, from an incapacity of the affected nerves proceeding from the periphery to re-excite reflected irritation, in which case they still obey the stronger stimulus proceeding from the will. The greater number of cases produced in support of this opinion, permit also another explanation, and according to what has been already said upon the ætiology of curvatures in general, is this state of palsy of the muscles of inspiration to be considered, not as a primary, but as a secondary state.

According to Gunther's (*b*) observations in snake-like *scoliosis* the muscles neither of the concave or convex side are much wasted, nor are they changed in form, although it so appears as long as they are attached to the body. They are only either stretched where passing over the projections, or folded when lying in the concavities. On the contrary, there appears a decided difference in the strength and weight of the corresponding muscles of the two sides, and that muscle increases which has an unfavourable position, and is therefore required to act with more power. So, for instance, the *m. cucullaris* of the concave side exceeds that of the convex about 90 grs. in a weight of 1550 grs.; the *m. latissimus dorsi* of the convex, that of the other side about 120 grs. in 1160 grs. If the relations of one muscle be so disproportionate that, in its natural circumstances, it either act not at all, or irregularly, its circumstances change, so that it detaches itself from some places, attaches itself to others more suitable, or forms new heads.

[According to Zink's opinion (*c*) *scoliosis* generally commences from the fifth to the eighth year of age, and between the third and fifth dorsal *vertebræ*, and the deviation is almost always towards the right shoulder-blade; that shoulder exhibiting

(*a*) Ueber Paralyse der Inspirationsmuskeln. Hanover, 1836.

(*b*) Pfaff's Mittheilungen, 1836, pt. ix. p. 10.

(*c*) Verhandl. der K. K. Gesellschaft der Aerzte zu Wien, 1842–43; and British and Foreign Medical Review, vol. xix. p. 370. 1845.

an excess of nutrition over the left, which is especially apparent in the blade-bones themselves. Such children have a remarkable tendency to lean towards the weaker side, while on every occasion requiring muscular exertion, they prefer the stronger hand. "From repeated observations," says ZINK, "I am convinced that the greater part of the mischief here detailed, is effected during sleep, and consequently, is in operation during one-third of the patient's daily existence. The heart then leans down towards the left side, and the lung on that side is compressed, one lung only (the right) performs its full office, and the muscles of respiration on that side are in a state of activity, greatly exceeding that of the left. I have also ascertained that the convexity of the deviation of the spine accords exactly with the insertion of those muscles which are most active in the process of respiration. This deviation from the perpendicular, so high up in the spinal column, is often overlooked, and the inferior and secondary contortion to the left side in the lumbar *vertebræ* is often regarded as the primary affection." And he farther observes:—"This disease is more frequent among the wealthy, and more commonly in females than males."

SYME (*a*) observes:—"There is one particular condition of lateral curvature certainly not common; yet, judging from the number of cases that have fallen within my own observation, I should say not extremely rare, in which complete relief may be afforded by the division of a muscle, and in no other way. I allude to spinal curvature depending upon wry neck, caused by contraction of the sterno-mastoid. This muscle is liable to contraction both spasmodic and permanent. The former does not, so far as I have seen, affect the shape of the spine, and in two cases treated by division, did not yield to the operation. But the latter is apt to produce lateral curvature in every degree and may be remedied with no less ease than certainty by subcutaneous incision" (p. 271)].

1350. The special *diagnosis* of curvatures in regard to their cause, is now to be considered. Great muscular weakness, resulting from previous disease, disturbed digestion, disturbed sexual development, and the like, by which gradually the joints of the spine are left to the unaided and inadequate strength of the ligaments, is characterized by weakness of the muscles, pain, and weariness of the spine, speedy tiring after every movement, dropping of the spine to one side or other, or forwards, and great mobility of the spine; so that, on examination in various positions of the body, alterations appear; when lying down, the deformities disappear, if they be not very great. In children who are very stout, and have a large head, whose muscles are too weak for the weight of their body, and especially of their head, there appears commonly at the time when they should begin to walk, incapability of so doing; and, when sitting, a great dropping forwards of the head, by which the spine projects backwards in a large curve; in lying down, this is diminished, but with carelessness, it becomes permanent, and always more considerable.

1351. The swelling of the fibrous intercartilage has been considered by DELPECH (*b*) as no rare cause of spinal curvature; it proceeds generally from one point to all the *vertebræ* in various degrees, or all may be at once attacked. In the former case sometimes severe, sometimes slight pain occurs at any one part of the spine, which consequently is deformed. This pain has not, however, always a definite and precise place: the patient points out the seat of pain in a vague manner, frequently on one or other side of the body, frequently at the *epigastrium*. A curvature appears, which, at first, is inconsiderable, and forms a pretty large curve. The direction of the inclination is determined by the greater or less thickness which one or several fibro-cartilages have obtained at any one part of their extent. Hence may arise curvatures backwards, forwards,

(*a*) Above cited. (*b*) Orthomorphie, vol. ii. p. 53.

and especially sideways. If a complication exist at the same time, for instance, a too short lower limb, a deforming scar, long continued pain, a forcibly-continued position, and so on, they may determine the direction of the inclination. This is, at first, slight, indefinite, and even transitory; it subsides, at least partially, in the horizontal posture, in the morning, immediately on getting up, and so long as the principal functions, especially digestion, are carried on satisfactorily. The curvature extends to the neighbouring *vertebræ*. These new curves disappear in the horizontal posture, and when the body is supported on the hands, whilst the primitive curves still exist. Subsequently these successive curvatures become permanent, and no longer subside in the experiments just mentioned. Sometimes walking and standing are rendered difficult by the curvature; the patient resorts to particular attitudes to keep himself upright, and, in a short time, new deformities are observed in the opposite direction, for the purpose of restoring the equilibrium of the body. These new curvatures may also subsequently become permanent. The curvatures form, at least before they are yet very old, more or less open, but regular arches.

If the swelling attack the fibrous inter-cartilages all at once, (cases which have been noticed by DELPECH only in lymphatic and weakly persons,) the patient is not capable of standing upright; he always seeks a resting place, loves repose, is apathetic, but yet restless; he avoids all exercise and all enjoyments of his age; the slightest walking tires him. Generally there appear disturbance of the digestive organs, palpitation of the heart, and oppression of the chest, which, however, are transitory. The patient avoids bending himself in any one direction; and in the most simple, and shortest walks, has frequent falls, accompanied with pain, which ceases as quickly as it came on, and the seat of which the patient cannot accurately determine. If sufficient pressure be made successively on the spinous process of each *vertebræ*, violent pain is excited in each and an epileptic attack, accompanied with convulsive movements of the upper and lower limbs. If the examination be made whilst the patient stands, epilepsy follows, with the painful sensation produced by pressure. On examining the spinal column, it is easily perceived that a greater or less mobility exists in almost all the *vertebræ*, but especially in those in which the pressure causes the symptoms mentioned. There still, however, appears no permanent deformity; but if the patient be carefully suspended by the head or by the arms, all appearance of deformity subsides, and it is clear that all are possible, but none yet exist which may become permanent. If the ailment continue to permit it, successive and alternate fixed curvatures occur, which quickly increase, but always retain their fundamental character, to wit, a greater or less large arch, generally of pretty large extent, but regular, and free from all angles. These curtures very readily increase.

1352. In the curvatures of the spinal column from softening of the bones, the spine usually projects backwards where one or several bodies of the *vertebræ* have sunk in, and a vertical flattening of the body of a *vertebra* takes place. The bending backwards is frequently connected with a slight disposition towards the side. At some distance from the original curvature, large curves and almost regular arches are formed. In rickets there are accompanying swellings of the condyles of the tubu-

lar bones, which also bend in various parts, disturbance of digestion, distended belly, and so on. In *osteomolacy*, the whole constitution is much affected for a long while before the curvature takes place, severe, commonly wandering pains, spreading over the breast and belly, frequently fixed in the spine, which increases at every movement, even on turning round in bed, precede and accompany curvature; febrile symptoms frequently appear; digestion and all the functions become more and more affected; the weakness is always greater, partly on that account, probably on account of the pain at every movement, the patient keeps one position in bed, which determines the direction of the inclination of the spine. In these curvatures the ribs especially, and the bones of the *pelvis*, are decidedly changed in their form and direction.

1353. The *prognosis* in curvatures of the spine, is directed generally according to the age of the subject, the duration, the cause, the degree, and complication of the disease. Many curvatures which, as yet, have not become permanent, and are connected with general disturbance of the health and weakness of the muscles, may, indeed, in rare cases subside, form favourable change of the constitution during the period of development, or from accidental improvement of the general state of health; but reliance on this self-assistance of nature is always dangerous; for, in most cases, experience commonly shows the case getting worse. The younger the patient, the slighter the degree of curvature, so much the easier is it of cure; in persons advanced in years, and in adults, the progress of the disease may be arrested by careful treatment, but no perfect cure is effected. If the cause of the curvature be a diseased condition of the bones, the *prognosis* is always more unfavourable than if it were in misproportions of the muscles. If inclinations of the spine, in different directions, exist, the treatment is more difficult than if there were merely one single inclination. In long-continued curvatures of the spine, such changes occur in the *vertebræ* that a cure is rendered impossible. It is therefore an important observation, in reference to this point, that the curvature remain without increase some two or three years, and still more important, that for an equally long time, all the vague symptoms of inexplicable injury of functions, which accompany the completion of the deformity, are progressively and completely stopped (*a*). In these cases the curvature is connected with *anchylosis* of the *vertebræ*, and the cure is impossible. In order to ascertain this, the patient, having stripped, should be laid flat on his belly, and rubbed with spirituous remedies on the extended muscles, but with relaxing remedies on those of which are contracted, and attempts should be made to restore the spine gradually to its natural direction. If the patient then feel a stretching and stress upon the curved part of the spine, and not at the insertion of the muscles, it may be decided that there is *anchylosis*. This condition of the curvature is more surely indicated, if previous or continued extension of the spine show no change in the curvature. On the other side, if changes in the spine be observed on carefully lifting the body by the head (1), so that the feet do not support the weight of the body, or in extansion whilst in the horizontal posture, there is more hope of restoration. *Anchylosis*, however, is not very

(*a*) DELPECH, above cited.

common, and usually only accompanying a long-continued great degree of curvature, and in persons of advanced age. The *scoliosis*, when it first occurs in adults, rarely attains the first degree. The *lordosis* is most easy, the *cyphosis* the most difficult of cure.

[(1) This practice of lifting by the head, to which CHELIUS very frequently recurs in these diseases, I think very objectionable and dangerous, especially in weakly children, who may be entirely free from disease, as the longitudinal ligaments of the spine may be insufficient to bear the weight of the lower part of the body. ASTLEY COOPER, in his lectures, was accustomed to inveigh bitterly against the foolish trick of showing children the way to London, as it is called, which consists in lifting them up by the chin and back of the head. CHELIUS's proposal is of the same kind, and equally objectionable.—J. F. S.]

1354. The *treatment* of curvature of the spinal column must be variously conducted, according to the different cause and nature of the deformity, that is, such remedies must be employed as counteract the causes in which it originates, and at the same time, or immediately after the straight direction must be restored by mechanical apparatus and other means operating on the spine. In former times the first indication was almost completely neglected; the treatment was, for the most part, purely mechanical, and partly thence, partly from the inadequacy of the mechanical apparatus, was imperfect, and in most cases, even hurtful. Only in modern times has this treatment become the object of careful inquiry, and employed on right principles, according to the difference of the causes of curvature. A survey of the various machines and contrivances which have been proposed for the treatment of the spinal curvature, give proof of this.

1355. The apparatus which have been proposed for cure of spinal curvature, act either by *pressure* or *extension*, or both together.

1356. To the apparatus, acting by pressure, belong

First. HEISTER's *iron cross* (*a*), which consists of two flat iron rods connected together in form of a T. On the transverse piece are two rings, by which the shoulders can be drawn back; at the extremity of the vertical piece descending along the back is a strap, by which it is attached to the body. B. BELL (*b*) has added to this machine a padded neck-band, connected to the cross by an iron rod, which may be fixed higher or lower, in order to keep the head more or less up.

Second. VAN GESSCHER's *apparatus* consists of a stirrup bound around the *pelvis*, on which two rods are attached with screws running upon the sides of the spinous processes, and rivetted above to a shoulder-piece, on the two ends of which are straps to draw the shoulders back.

1357. To the apparatus operating by extension, belong, first of all, the *extending beds and stretching apparatus* of VENEL and SCHREGER (*c*), LAFOND (*d*), SHAW (*e*), MAISONABE (*f*), BLÖMER (*g*), LANGENBECK (*h*), DELPECH (*i*), HEINE, and others, in which the patient is fastened, by

(*a*) Institutiones, Chirurgicæ, pl. viii. f. 13.
(*b*) Lehrbegriff, vol. v. pl. iv. f. 5, 6, 7.
(*c*) Versuch eines Streckapparates zum nächtlichen Gebrauche für Rückgrathsgekrümmte. Erlangen, 1810. 4to.; with copper-plates.
(*d*) London Medical and Physical Journal, Dec. 1826, p. 497.
(*e*) Above cited.
(*f*) Journal Clinique des Difformités, Dec. 1825, No. ii.
(*g*) Journal von GRAEFE und von WALTHER, vol. ix. pt. iv. Compare FRÖRIEP's Chirurg. Kupfertafeln, pl. clix. clxxxii.
(*h*) MUHRY, Dissert. de spinæ distortionibus et pede equino. Götting., 1829.
(*i*) Orthomorphie, pl. 40, 41.

means of padded straps applied on the feet and head, above and below to a bed or chair, and the extension of the whole body is kept up by sufficiently strong springs. In some of these machines it is attempted simultaneously to employ pressure, by means of solid pillows thrust beneath the back, or as in the stretching apparatus of DELPECH and LANGENBECK, by elastic traces carried around the body from one to the other side of the bed. The same object is effected only momentarily, by the so-called *neck-swing* (*escarpolette*) of CLISSON, in which a broad cloth is applied around the patient's neck, and to its two sides is attached, behind the ears, a bandage which is carried through a pulley attached to the ceiling, wherewith the patient draws himself up as long as he can bear it.

Here also belongs LE VACHER's machine which consists of stays, laced in front, and having a plate attached to its hind part. An iron rod passes into a groove upon this plate, which ascends straight up the middle of the neck, and thence curves over the head to the forehead. In the notch at the upper end of this rod is hung an apparatus which is fastened around the head and beneath the chin of the patient. PELUG (*a*) has improved this machine by attaching, instead of the head-apparatus, at the end of the iron rod which reaches only to the upper part of the neck, a neck-band, by which the chin and *occiput* can be held up. SHELDRAKE altered LE VECHER's machine; he took away the stays and fastened the iron rod on a plate which descended from the middle of the back and fitted closely to the rump-bone. DELACROIX also altered this machine, making its point of support on the *pelvis* (*b*). GUERIN (*c*) has proposed an apparatus for the simultaneous extension (*extension sigmoide*) of the vertebral column in contrary directions of the curvature.

Hereto also must be referred DARWIN's (*d*) advice, to keep the patient, at the onset of the curvature, for a long time in the horizontal posture, and if this be insufficient, to let him sit on a particular kind of seat, in which, by a special contrivance, the shoulders can be raised and the head supported. BLŒMER and LAFOND's stretching chair (*e*).

1358. The apparatus acting by extension and pressure, are—

First. SCHMIDT's *apparatus* (*f*). consisting of two semicircles connected together, which lie upon the hip-bones, and from whence rise up two sheaths, or the reception of two rods, which at their upper part have a semicircular sweep outwards for supporting the shoulders, and are moveable higher or lower. At the upper part of each sheath is a semicircle, to which two rods are attached, their upper ends thrown round the half circles, like hooks, their lower ends curved round the half circles, encompassing the *pelvis* and ascending within it. These processes, covered with leather, form long pads, which are brought close to, or separated from the rods, by screws. Well-fitting stays surround the front of the chest. The apparatus of LANGENBECK (*g*) and VON GRAEFE (*h*) are constructed on the same principles.

(*a*) BERNSTEIN, Systemat. Darstellung des Chirurgischen Verbandes, p. 259.

(*b*) GERDY, above cited. Chirurg. Kupfertafeln, pl. clxix.

(*c*) Gazette Médicale, Nov. 1835, p. 732.

(*d*) Zoonomia, or the Laws of Organic Life. London, 4to. 2 vols. 1794-96.

(*e*) FRORIEP's Chirurgische Kupfertafeln, pl. cxxxiv. clix. clxix. clxxxii. ccxl. ccxlvi.

(*f*) Beschreibung einer neuen Maschine zur Verminderung und Heilung der Buchel. Leipzig, 1796. 8vo.

(*g*) Bibliothek für die Chirurgie, vol. iii. pt. ii. pl. ii. f. 3.

(*h*) MALSCH, G. Dissert. de novâ machinâ

Second. JÖRG's *apparatus* (*a*) consists of a firm and an elastic part; the former is made of linden wood, covered with soft leather; the latter consists of several springs laid close together and covered, connected at the one end with the firm part and at the other end fastened with a buckle. In *scoliosis* the firm part is applied to the concave side of the trunk, below it rests upon the hip, and above, just against the shoulder. The elastic half is carried round the other side (for the first degree of *scoliosis*, JÖRG employs an elastic brace, which is attached to the breeches usually worn, before and behind, in the middle by a button, and passes over the shoulder of the projecting side, where a pad is placed beneath it). In *cyphosis* this apparatus is applied with the alteration, that the firm part is always applied where the trunk is concave, and the elastic half on the seat of the projection.

A. PORTAL had already proposed to a certain extent a similar apparatus, consisting of a double fork, which is fastened on the sides to a pair of stays, so that the arm above and the hip below serve for its application (*b*).

The GRAEFEAN apparatus is composed—1. Of a *loin-girdle*, which by means of a pair of semilunar plates rests upon the crests of the hip-bones. The hinder ends of this girdle may be introduced into each other, and fastened with a screw. The front ends are connected with a buckle. Upon the semilunar plates are studs on both sides, on which is fastened a strap, destined to support the belly. All this part of the machine is stuffed with hair and covered with leather. 2. Of a *breast-girdle*, which like the lower one consists of two semicircles, connected behind in the same way as the lower one; and in front, in males, fastened together by a strap and buckle; but in females, segments are applied around the breasts. 3. On the loin and chest-girdle there are, on both sides, two rods firmly connected with the former, and with the second by a steel plate. These rods form beneath quadrangular sheaths, which terminate in quadrangular capsules, on the outside of each of which is a quadrangular prominence. In the interior of these sheaths is an endless screw, which can be raised up or depressed by means of a roller fixed on the quadrangular projection. The rest of the sheath above the quadrangular process is formed into a cylinder, in which is a spiral spring. Into the upper opening of this cylindrical part of the sheath is the rod received, having upon it the support for the shoulder, which is properly padded, and so attached to the rod that it can be differently placed, according to the different form of the shoulder. For the purpose of connecting pressure on the spine with this extending apparatus, cushions are applied, by means of screws on the breast or loin-girdle, according to the difference of place to which pressure is to be applied.

I have made the following alterations in this apparatus to render it more simple and less costly. A case of iron plate, properly padded, and enclosing the *pelvis* up to the upper spine of the hip-bone, is fastened in front with a broad strap and buckle. On both sides of this *pelvis* case are two buckles, in which two rods connected with each other are inserted. At the upper end, these rods are connected with an iron plate, through the middle of which a screw passes, quadrangular at its lower end, and at the upper, the properly padded supports are attached, which may be placed higher or lower, by means of a key fitting the quadrangular end of the screw; thus the apparatus acts like GRAEFE's. For the purpose of making graduate pressure I do not employ cushions, but elastic bands, (after JOERGE's plan,) which in *cyphosis* lie upon the back, and are attached to brass studs on both rods; but in *scoliosis*, to the studs on one rod over the projecting side of the trunk, between it and the ascending rod, for the purpose of surrounding the whole body, and again is attached to the stud of the first rod. In inclination in two opposite directions, this yoke may be applied, also in contrary directions. If the shoulder-blade particularly project, I carry an elastic band over the more elevated shoulder, and fastened behind and before to that going around the body. I allow this apparatus to be worn day and

Graefianâ distorsiones spinæ dorsi ad sananda nec non disquisitio deformitatum istarum. Berol., 1818. 4to.; with copper-plates.

(*a*) Above cited, pl. v. f. l.

(*b*) Précis de Chirurg. prat., vol. i. Paris, 1761.

night over a close shirt. From its careful employment I have derived the happiest results (*a*).

1359. It were superfluous to enter on a special criticism of the several apparatus. Those contrivances only which at once effect extension and pressure can act efficiently. Of the portable apparatus of this kind, those only answer the object which have their point of support on the *pelvis*, and are so constructed that they cause no painful pressure, nor too great compression of the chest, and so on. With proper consideration of the points still to be mentioned in reference to special treatment, the cure may indeed be effected with these apparatus in incipient and slight degrees of curvature, and specially in lateral curvature produced by unequal muscular activity, as I have so frequently had opportunity to observe in the use of my above-described apparatus, which is distinguished from that in which pressure is made by the cushions, by the lateral elastic bands. Such favourable result is, however, only possible with close and careful attention, and when, especially, all the circumstances of the patient are properly regulated. When this is not the case, the disease becomes really worse, or at least all the time is lost which could have been best employed for the cure of the deformity. For all great degrees of curvature, such treatment is insufficient; a continued employment of the extending apparatus is necessary, the operation of which is not equally certain as that of the portable apparatus, and among which that is best, in which, at the same time, bands are attached, to operate on the opposite sides of the trunk, as, for instance, in the extending apparatus of Delpech, Langenbeck, and others.

1360. Such treatment can only in reality be carried on with suitable care in special institutions for the purpose; and this is the reason why of late these (orthopedic) institutions have become so very numerous. There is, however, a well grounded complaint, that in many of them the entire treatment is conducted in a too mechanical manner; and that by too long-continued use of the extending apparatus, with constant rest, the greatest injury is caused to the whole constitution of the patient; so that, as I unfortunately have seen in several cases, with slight or merely transitory improvement of the curvature, disorder of the health difficult to be got rid of, and even incurable, has been thereby produced.

Those cases are not to be now considered where the disease of the spine is of a completely different kind, and not to be thus treated.

1361. Delpech has the great merit, by combining a regular course of gymnastics with the use of the extending apparatus, of getting rid of those disadvantages which have been properly objected to on account of the above-mentioned causes, by the usual employment of the latter, and especially by the proper estimation of the operation of such gymnastics, of having opened a new and very successful path in the treatment of this deformity.

1362. These gymnastics have the especial object of relieving the *vertebræ* from each other's weight for several hours daily; of supporting the weight of the body, without condemning it immediately to rest and its ill consequences; of exciting the activity of the muscles to sufficient continuance and power, so that it may be advantageous to the nourish-

(*a*) Gruber, S. P. G., Dissert. de novâ machinâ Cheliusianâ ad sanandam gibbositatem, cui accedit hujus morbi descriptio. 1825. 4to.; with copper-plates.

ment of these organs, and to the improvement of the whole constitution; to employ all the muscles, without exception, in increased exertion, and by means of motion, extension, and pressure, employed in all directions, to reach the affected parts of the spine. These exercises are to be used daily for two or three hours, and then, according to the state of the deformity, the necessary extension in the stretching-bed, or some special apparatus is to be employed. Delpech considers swimming as very proper, but otherwise he does not use bathing, if no special reason call for its use: neither does he employ friction and the like, because by the exercises the muscles are acted on far more properly and more powerfully than by those means.

These exercises, which are undertaken gradually, and extended to all the muscles, are, movements upon the swing, exercises and games on the spiral ladder, exercises on the knotted rope, games on the loose rope and climbing pole, games on the obliquely-stretched rope, on the straight and obliquely-stretched ladder, games on the tight rope and flying bridge, the use of a windlas, games with the horizontal pole, and so on. The atlas accompanying Delpech's work gives a sufficient representation of these different exercises.

Where no special institution is at hand, apparatus for these exercises must be introduced into every room, yard, or garden. I have for several years (in my private practice) employed such appropriate gymnastic exercises, in connexion with other remedies in the treatment of curvatures, with the desired results.

1363. If the cause of the curvature be in an unequal contraction of the muscles, in which ordinarily the left side sinks down, the right shoulder-blade projects, and the right shoulder is raised, it must be treated according to the general rules laid down. It is usually attempted by rubbing in suppling ointments, or oily remedies to relax the contracted muscles of the sunken side, and by rubbing opodeldoc, *spiritus serpylli c. liq. ammon. caust., tinct. canthar.*, with some volatile additions, to excite the muscles of the protruding side to action. For these cases the employment of electricity, repeated blisters and the *douche* upon the side of the extended muscles, have been also recommended. In the rubbings, which are to be performed night and morning, the patient should be stretched on his belly, and they should be continued from half to a whole hour, and attempts are, in the meantime, to be made to press the spine into its natural direction. These rubbings operate certainly less through the substances rubbed in, than from the pressure, kneading, and stretching of the contracted muscles. If the nervous activity be in these cases diminished, the rubbing should be more active; spirituous remedies, and even the application of stronger irritating remedies are indicated. In incipient *scoliosis*, if care be taken that the patient carry himself properly, that the two halves of the body be equally exerted, that all faulty posture in writing and the like be diminished, that he often hang by his hands, and keep the horizontal posture in bed, upon a hard mattrass, a perfect cure may be effected. Here also well-fitting stays, with whalebone or elastic springs, will be of much use, as they properly support the body (1). In more considerable curvature, regulated gymnastic exercises, the use of a properly constructed portable apparatus, or better, the employment of a stretching apparatus, is most suitable. In these cases, the *scoliosis* does not usually affect the general state of health, and we see that the mechanical means are best endured. If the constitution be at the same time affected, corresponding remedies and suitable dietetic care must be employed.

(1) The prejudices which have been very properly made to the stays (*a*), has no reference to this determination of their employment.

1364. For the quicker cure of curvatures of the spine, depending on muscular contraction, GUERIN (*b*) has proposed the division of the contracted and shortened muscles, and practised it in several cases. The muscles which he cut through were *m. cucullaris*, *rhomboideus*, *levator anguli scapulæ*, *sacro-lumbalis*, *longissimus dorsi*, and *semi spinales*. He has performed the division in persons of both sexes, and of different ages: the youngest was thirteen, and the oldest twenty-two years of age. All the curvatures were in the second and third degrees, with distortion of the spine and corresponding humps. In some a single division of the shortened muscle was sufficient; in others a second and third was undertaken. In all he obtained, immediately after the operation, a very striking degree of straightening of the spinal column; and in a man of twenty-one years of age, whose curvature had been subjected to a ten months' mechanical treatment, he effected an immediate straightening by cutting through the *m. longissimus dorsi*, and the corresponding *m. semi-spinales*. In other subjects he carried on the treatment by mechanical means with decidedly good effect. Although the subcutaneous division of the muscles of the back has been undertaken by other persons, I cannot, from the practice in question, give so decided judgment of its fitness, as the numerous and careful observations upon tenotomy in other curvatures have allowed.

[In regard to the division of the muscles for the cure of curvature of the spine ROBERT HUNTER of Glasgow (*c*) says:—"In no instance has the operation of itself produced a cure; but in all the cases on which I have operated, with one exception, it manifestly placed the patient in a more favourable state for the performance of a cure. The operation itself appears to me to effect no more than to take off, either in part or whole, the power of muscles that are interested in maintaining the curvature, and thus placing the spine in a condition to be more easily influenced by mechanical and physiological causes. The cases which have been treated by me have all been of long standing, none less than seven years, and some ten, sixteen, and twenty years, and all with considerable torsion and gibbosity, as well as lateral curvature. * * * In some instances the section of the muscles was instantaneously followed by an obvious improvement in the state and appearance of the back; in other instances I could discover no change whatever.

"I perform," says R. HUNTER, "the subcutaneous section of the dorsal muscles at four different places of the back. 1st. I weaken the tension of the deepest-seated layer of muscles—that formed by the *multifidus spinæ* by dividing the thickest part of that muscle, as it lies comparatively superficially upon the *dorsum* of the *sacrum*, opposite the posterior superior spinous process of the *ilium*; 2d and 3d, I remove the tension of the middle layer of spinal muscles, that formed by the *longissimus dorsi* and *sacro-lumbalis*, by cutting these muscles across, sometimes in the lumbar region, and sometimes in the costal region, according to the circumstances of the case; but more frequently in the lumbar region, near the origin of these muscles; 4th, to destroy the tension of the flat and more superficial muscles, I divide these muscles by a longitudinal incision, close to the spinous process of the *vertebræ*, at the place where the tension of the muscles appears to be the greatest. In one instance I cut through, with considerable effect, the *latissimus dorsi* at the side of the chest, and consequently at some distance from the spine. The muscle crossed the contracted and concave side of the trunk, and appeared to be accessory in huddling in the ribs of that side. When the patient attempted to elongate that side, a cord, as thick as the little finger, was seen stretching from the crest of the *ilium* to the *scapula*; as soon as this rigid

(*a*) SOEMMERING, S. T., Ueber die Schädlichkeit der Schnurbruste. Berlin, 1793.

(*b*) Gazette Médicale de Paris. 1840. No. 14, 15.

(*c*) On the Section of the Muscles in Spinal Curvature; in London Medical Gazette, vol. xxxii. 1842.

cord of muscle was cut through, the ribs became less huddled together, and that side could be elongated to a much greater degree, and the spine materially affected. The cutting of the dorsal muscle is only the first, though an important step in the treatment of spinal deformities. The means that are afterwards employed in conducting such cases to a successful issue, are both mechanical and physiological. The first consist in the application of pressure, made in various ways, and by various means, to assist in the gradual return of the parts to their natural places; and the second, without which the first would be useless and unavailing, consists in infusing power into the muscles which have become weak or dormant from disease, by simply calling these muscles frequently, and in various combinations into action. (p .)

In reference to the division of "certain muscles of the back, on the contracted state of which it was alleged the distortion depended," Syme observes, "nothing could be more erroneous than this view of the case, since the muscles throughout its production and existence are entirely passive. They, from the first, do not draw the spine away, but allow it to bend, their fault being weakness, and not undue contraction, so that those requiring to be connected are seated on the convexity of the curve, instead of its concavity, and it is needless to add, could not be strengthened by division of their substance." (p. 271.)

I have not had any experience upon the subject, but am rather disposed to agree in opinion with Syme.—J. F. S.]

1365. In curvatures dependent on great muscular weakness, internal tonic remedies must be employed, as bark, acorn coffee, and the like; a strengthening succulent diet, the use of generous wines, chalybeate mineral waters, rubbing in volatile, aromatic, and spirituous remedies, steel, salt, or aromatic bathing, river bathing, and so on. In these cases the gymnastic exercises are especially effective, and, by their proper arrangement, the injuries are more certainly prevented, which otherwise are necessarily produced by rest and inactivity of the muscles, accompanied with the use of the stretching apparatus. In children who begin to walk, it is usually sufficient to rub the back and lower limbs with spirituous remedies, to prevent sitting, and to let them sleep upon a hard mattrass.

In the high shoulder attempts must be made to relax and continually depress the too violently acting muscles, by proper rubbing, proper carriage and exercise, for which purpose the one-sided breeches brace, recommended by Jörg, is most suitable. In high back, if there be at the same time a bowing forwards of the head, the machine recommended by Shaw (*a*), is best, by which the muscles of the nape are put in greater activity, and drawing back the head is effected.

1366. If the curvature of the spine depend on softening and thickening of the fibrous inter-cartilage, the readiness with which, by extension, the direction of the spine can be changed, renders it in the highest degree proper. If, by pressure, movement between the several *vertebræ* can be brought about, there is no need of making any attempt at extension, nor of employing any other means which act forcibly on the *vertebræ*. The altered joints must first acquire more firmness. If, at the same time, there be pain, which, although not symptomatic of inflammation, leads to the belief of a passive gorging of the blood-vessels, a condition which by neglect passes on to inflammation and suppuration, leeches and cupping are to be first employed, though not to excess; afterwards rubbing in volatile camphor liniment, blisters, issues, cold *douche* bath, warm *douche* bath of salt water, of water containing sulphuretted hydrogen, even *moxas*, especially on the principal seat of the deformity. The patient should observe a quiet posture on the back, and afterwards cau-

(*a*) Engravings, pl. vii. f. i. and described in his Essay on Distortions, already quoted.

tiously use the easiest gymnastic exercises; for instance, the motions with the barrow and rope. The patient's powers must be supported by a nutritious diet and proper medicines.

If the nature of this aliment be ascertained only by the horizontal posture, or by careful attempts at extension, if no other pain exist than that caused by careful extension, if it be not increased by pressure on the painful spot, and if it decrease by resting quietly on the back, the gymnastic exercises may be at once begun, with caution; then followed by the employment of extension; and lastly, the lateral bandages (*a*) may be also employed.

1367. In curvature of the spine depending on rickets, the treatment must be especially directed towards the improvement of digestion and chylification, by tonic remedies and strengthening diet, aromatic and spirituous rubbings, strengthening baths, lying in the open air upon a sand-bank, warmed by the sun, or to be employed; horizontal posture upon a hard mattress, and subsequently, gymnastic exercises and the extending apparatus are to be carefully made use of. The treatment is similar in *osteomalacy;* bark with phosphoric acid is here especially efficient, as I have repeatedly observed. The very severe pain often occurring in these cases, must not lead to the application of leeches, and so on. Besides proper position, and support of the body in general, nothing farther can be done in these cases against the curvature.

1368. If the curvature be connected with rheumatism, a correspondent treatment must be employed; and the complication having been got rid of, the treatment of the curvature must be thought about. Palsy of one or several muscles often occurs from rheumatism; in such cases, moxas, *douche* baths, purgatives long continued, and the like, are very efficient.

Curvatures of the spine, from contraction of one side of the chest, after the cure of an *empyema*, or abscess in the lungs, are incurable, and every attempt at their treatment inadmissible and dangerous. Curvatures from shortening of one of the lower limbs, may, in many instances, be prevented by a peculiar shoe and the like, by which the proper length of the limb is attained.

III.—Of Curvatures of the Limbs.

[The several portions of the lower limbs are occasionally and variously curved and contracted upon each other, either as original imperfect developments, or resulting at any period of life from different causes, which may be either inflammatory, or from paralytic affection of one set of muscles, whilst their antagonists still possess their contractile power, and, being unopposed, draw together more or less completely those portions of the limb to which they are attached. The fixedness of the limbs from either of these causes must not be confused with that depending on *anchylosis*, already considered (*par.* 224*) (*b*) in which, after more or less complete destruction of their cartilages, the joint-ends of the bones are fixed in any position they may have acquired, during the progress of the disease, by a fibrous or bony union. The cases now to be considered depend entirely upon the condition of the muscles, their tendons, and

(*a*) Delpech, Orthomorphie, vol. ii. p 238. (*b*) Vol. i. p 267.

tendinous sheaths, whilst the joints themselves have their structure entirely changed, or but very little altered; and in such only can surgical treatment be of any avail.

1.—OF CURVATURES OF THE LOWER LIMBS.

Curvatures of the lower, are more frequent than those of the upper limbs, although the bony and muscular fabric of the former are much more strong and powerful, partly because the weight of the body resting upon them more readily produces curvature, under the existence of favouring circumstances; and partly because in most cases, in incipient and even in advanced curvature, walking produces an injurious effect upon the lower limbs. Of the several joints of the lower extremity, curvature is least frequent at the hip, and most common, and, indeed, not infrequent, at the ankle, at which also it was most generally an original malformation.

A.—OF CURVATURES OF THE HIP.

Curvature or contraction of the thigh upon the belly (*Scelocampsis*, Lat.; *Angezogensein des Oberschenkels an den Unterleib*) may originate in the continued action of the flexing muscles of the thigh, whilst their antagonists are palsied from any cause, or from sympathetic affection of the former muscles, with disease of the *vertebræ*, which is sometimes consequent on *metastasis*, or from inflammation in the *m. psoas*.

The *treatment* of these cases consists in relaxing the contracted muscles by supplying applications, and in exciting the inactive or palsied muscles to action by the use of irritating remedies; and if these fail, the division of the flexion muscles, to wit, the *m. pectineus* and *sartorius* has been proposed and performed by Stromeyer (*a*), but which, as far as I am aware, although successful, has not been repeated by any one else.

In a case of metastatic inflammation of the spine following measles, in a child of ten years, in which the thigh, at first drawn close up to the belly, by yielding of the lumbar muscles after the use of tartarized antimonial ointment, blisters and rubbing in mercurial ointment, could be drawn down to a right angle, Stromeyer divided the *m. pectineus* and *sartorius* with success. The division was made in the following manner:—One assistant fixed the *pelvis*, whilst another stretched the contracted thigh, which raised the *m. pectineus* so that the finger could be passed behind it from its outer side, an inch and a half below its origin. A strong *phimosis*-knife was then introduced upon the finger through the upper half of the muscle, dividing it, and penetrating the skin. He then cut through one half of its breadth beneath the skin, and afterwards divided the second inner and under half; and only a few drops of blood followed the four little punctures made in the operation. The *m. sartorius* was divided, by adducting the knee so as to make the muscle prominent; and having raised it with the thumb and finger of the left hand, he thrust a *phimosis*-knife through, about two and a half inches below its origin, and divided the muscle beneath the skin, the ends of which separated rather more than half an inch. The leg immediately straightened without the least difficulty, and having been kept on an extending apparatus for a fortnight, was allowed to get up, and in the course of three months walked about well. (pp. 119, 20.)

(*a*) Above cited.

B.—OF CURVATURES OF THE KNEE.

Curvature of the knee may be either congenital or acquired, and depending on imperfect development of the muscles, tendons, and *fasciæ*, or on their shortening consequent on inflammation, either of the structures themselves or of the cellular tissue around or in the neigbourhood of the joint, or simply from inaction. This condition is to be distinguished from the curvature which almost invariably accompanies *anchylosis* following ulceration of the joint-cartilages, and which has been already considered.

One knee may curve or bend inwards, producing the deformity called *In-knee* (*Genu valgum*, Lat.; *Ziegenbein*, *Schemmelbein*, Germ.; *Genou en dedans*, Fr.) or *Knock-knees*, when both knees are in like manner affected. It is characterized by a projection inwards of the inner condyle of the thigh-bone, with a less or great divergency of the leg and foot outwards, so that in standing the feet are far apart from each other, and the thigh-bones, overhanging the inside of the heads of the shin-bones, are, together with the weight of the body, supported mainly by the internal lateral ligaments of the knee-joints. The knees also, instead of being against the same imaginary plane, are placed one behind the other. When this deformity is great, walking is very awkwardly performed, as it is necessary, in bringing the leg forwards, to abduct it considerably, to avoid striking the knees together; and in consequence of the oblique direction of the leg, the inner ankle also bends inwards and the person treads upon the inside of the foot.

This is a very common ailment in labouring persons who carry very heavy weights, but is generally worst in those accustomed to wheel heavy barrows. It, however, is by no means unfrequent in young people who grow quickly, but is often recovered from, as their bodily strength improves, unless occupied with hard labour.

Little can be done for this distortion, which I have in one or two persons known to incapacitate from following any laborious employment, besides supporting bandages and cold *douche* baths. Although irons are recommended, I have not seen much benefit from them.

The knee may also be curved outwards (*Genu varam*, Lat.; *Säbelbein*, Germ;) this is, however, rare, and must not be confused with the so-called *bow leg*, which depends principally on outward curving of the shin-bone, and to which the slight outward bend of the knee is only consequent.

Toe knee is, however, most commonly bent forward, (*Contractura Genu*, Lat.; *Vorwärtsbeugung des Kniees*, Germ.;) and this may occur from original shortening of the bending muscles of the leg, or of the *fascia* covering the thigh, an account of which last was first published by Froreip (*a*), who found in a corpse, that although the flexing muscles were cut through yet the knee could not be straightened. Very frequently the knee is bent at a later period of life, and the most common causes are rheumatic inflammation of the tendinous structures about the joint independent of disease of its interior, or scrofulous inflammation

(*a*) Chirurg. Kupfert, No. 346.

running on to suppuration, around or even in the joint itself. Palsy of the extending muscles may also give rise to this kind of bending of the knee.

The *treatment* of these cases consists in rubbing and in the application of extending apparatus and the use of passive motion, from patiently persisting with which for a long period, considerable benefit and occasional cure results; but in those cases which cannot be managed, it has been recommended to divide the hamstrings, an operation, I believe, first practised by Michaelis (*a*), who had performed it three times previous to October, 1810, and it has since been occasionally performed with varied success. The operation is performed, either by division of the hamstring tendons at once, or by partial and repeated cuts till they are completely divided, using at the same time an extending apparatus as the patient can bear it. Objections, however, have been made to the operation, that in consequence of the often long-continued bent position of the leg, the joint surfaces in the knee are so much altered in form that they cannot retain their reacquired natural position, and consequently dislocation of the shin-bone backwards occurs (1). The operation is performed by passing a *phimosis*-knife between the hamstring and the bone, or between it and the skin, taking care to avoid the *peroneal* artery and posterior *tibial* nerve (2).

(1) Fergusson, of King's College, informs me, that in two or three instances he has seen dislocation at the knee occur after division of the hamstrings for contracted knee, and has been obliged to amputate the limb.

(2) Stanley (*b*) operated on a case of contracted knees two years after *paraplegia* consequent on sleeping on a damp bed. "Each knee joint was immoveably fixed in the state of extreme flexion; the ham-strings were contracted and rigid; and the cellular tissue around them had become indurated, and firmly agglutinated to the tendons, whereby their outline could not be distinctly traced. * * * To avoid all risk of injuring the popliteal or peroneal nerve, he deemed it prudent to divide the rigid hamstrings, and the surrounding indurated cellular tissue, by small subcutaneous incisions many times repeated in both limbs, applying after each operation the apparatus for extending the knee-joint." By this proceeding, after many months, the joints slowly straightened, and became moveable; but, the action of the ankle-joints being impeded by the rigidity of the Achilles' tendons, Stanley divided these, and afterwards the extensor tendon of each great toe, as it was rigid, and kept the toes constantly raised. Warm baths and friction were employed for supplying the limbs, and, at the end of eighteen months, the case was perfectly cured. —J. F. S.]

C.—OF CURVATURES OF THE FEET.

1369. The feet may be curved in various ways; thus, they may be turned inwards (*Vari*) or outwards, (*Valgi*,) or the sole of the foot and the heel may be inclined so backwards and upwards, that the entire sole shall have the same direction as the leg, or the foot may be so drawn forwards and upwards towards the shin-bone, that the point of the heel alone touches the ground. The first kind of curvature is called *Club-foot*; the second, *Splay-foot*; the third *Horse-foot*; and the fourth, *Heel* or *Hook-foot* (*Pied-bot calcairen* of Scoutetten.)

(*a*) Ueber die Schwächung der Lehnen durch Einschneidung; in Hufeland and Humby's Journ. der. prak. Heilk., vol. vi.

(*b*) London Medical Gazette, vol. xxxv. p. 98. 1844.

Duval (*a*) includes the various curvatures of the foot under the general name *strephopodie*, and distinguishes varus as *strephendopodie*, valgus as *strephexopodie*, horse-foot as *strephocatopodie*, its highest degree as *strephypopodie*, and heel-foot as *strephanopodie*.

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a.—OF CLUB-FOOT.

(*Varus*, Lat.; *Klumpfuss, Knollfuss*, Germ.; *Pied-bot*, Fr.)

Sheldrake, Thomas, Observations on the Causes of Distortions of the Legs of Children. London, 1794.

Ibid., A Practical Treatise on the Club-foot. London. 1798.

Brückner, Ar., Ueber die Natur, Ursachen und Behandlung der einwärts gekrümmten Füsse. Goath, 1796. 8vo.

Numburg, J. S., Adhandlung von der Beinkrümmung. Leipzig, 1796. 8vo.

Wantzel, J. M., Dissert. de talipedibus variis. Tubingæ, 1798.

Scarpa, A., Memoria Chirurgica sui Piedi torti congeniti dei Fanciulli, e sulla Maniera di corregere questa Deformita. Pavia, 1817. Third edition. 8vo.

Jörg, Ueber Klumpfüsse und eine leichte und zweckmässige Heilung derselben. Leipzig und Marburg, 1806. 4to.; with copper-plates.

Delpech, Considérations sur la difformité appelée Pied-bots; in Clinique Chirurgicale de Montpellier, p. 147.

Held, Charles, Dissertation sur le Pied-bot. Strasbourg, 1836.

Little, W. J., Symbolæ ad talipedem varum cognoscendum. Berlin, 1837.

Ibid., A Treatise on the Nature of Club-foot, and analogous Distortions, including their treatment, both with and without surgical operations; illustrated by a series of cases, and numerous practical instructions. London and Leipzig, 1839. 8vo.

Stromeyer, L., above cited.

Scoutyetten, H., Mémoire sur la Cure radicale des Pied-bots. Paris, 1838; with plates.

Bouvier, Mémoire sur la Section du Tendon d'Achille, dans le traitement des Pied-bots. Paris, 1838.

Dieffenbach, above cited, p. 73.

Bonnet, above cited.

Phillips, above cited.

Duval, V., Traité pratique du Pied-bot. Paris, 1839.

[Mutter, T. D. A lecture on Loxarthrus, or Club Foot, Philadelphia, 1839.

See also an elaborate essay on Club Foot and some analogous diseases, in the New York Journ. of Med. & Surg., for January, 1840, by Dr. William Detmold.

Bigelow, H. J., Manual of Orthopedic Surgery, Boston, 1845. 8vo.—G. W. N.]

1370. *Club-foot* is that deformity in which the foot is so twisted on its long axis, that its inner edge is raised, the outer turned downwards, and the sole of the foot with its back brought more or less vertical. The toes are strongly bent, the back of the foot more convex, the sole more concave, and the heel raised, and inclined inwards, so that it does not touch the ground. The whole foot is unnaturally turned inwards. Upon the back (instep) of the foot, a considerable prominence is formed by the head of the *astragalus;* the Achilles' tendon is much stretched. Walking is more or less interfered with; the patient cannot tread upon the sole of his foot, but only on the middle of its outer edge, and, often only on the outer part of the back of the foot, where commonly a large calosity, or mucous bag, is enlarged or newly formed. The patient is never able to bend his foot by muscular power; but, in making the attempt, he rather adducts the foot already inclined inwards.

(*a*) Révue Médicale, Dec. 1818.

1371. Club-foot has various degrees. When slight, the curved foot may be brought back to its natural position, and the prominence on its back then disappears; but the foot again treads in its unnatural posture, when walking is attempted. In the higher degrees, the foot can never be at once brought to its natural position, and often can scarcely be moved in that direction. In these motions of the foot, the fibres of the *m. gastrocnemii* and *tibialis anticus*, and the plantar *aponeurosis*, which are always more or less stretched, oppose the straightening of the foot.

1372. This malformation, which has been noticed as hereditary, is either congenital, or occurs subsequently. In the former case, which is the most common, the club-foot arises as consequence of arrested development; of a continuing, excessive activity of the bending muscles of the foot, as has been often observed in a three months' *fœtus;* or as consequence of peculiar position of the foot during pregnancy, and therewith also deficient innervation depending on diseased activity of the brain, and nervous system. After birth, club-foot may be developed by wounds, palsy of muscles, by spasm or *neuralgia*, and if the foot have been kept a long while in a particular posture by an ulcer, or any other painful circumstance, by which shortening of certain muscles is produced. The disturbed antagonism of muscles (contraction of those attached to the sole, and to the inner edge, extension of those to the outer edge, and back of the foot) is the special cause of this malformation; all the changes which therewith occur in the ligaments and bones are merely secondary symptoms. The shortened muscles are *m. tibialis anticus*, and *posticus, gastrocnemii, soleus*, and *plantaris*, the plantar *fascia, m. flexor longus digitorum pedis, abductor pollicis, transversalis pedis, flexor brevis minimi digiti, flexor longus*, and *brevis pollicis*. The lengthened muscles are *m. peroneus longus, tertius, brevis, extensor longus* and *brevis digitorum pedis, abductor minimi digiti*. All the ligaments on the plantar surface, and on the inside of the foot, are shortened, as, on the contrary, those on its back and outer edge are lengthened. The tarsal bones are herewith, according to the degree of curving, more or less removed from their mutual contact, without entirely leaving the sockets or hollows, in which they had been received. The navicular, the cuboid, the heel-bone, and *astragalus*, especially change their position, and are twisted on their small axis. If club-foot exist long, the bones are fixed in their unnatural position, and more or less changed in their form.

Opinions as to the cause of club-foot are very various. The notions of Paré and others, who held it to be the consequence of long sitting during pregnancy, with the legs twisted over each other, or from pressure of the feet in washing and carrying children, are merely to be mentioned. Duverney (*a*) fixed the cause of these curvatures in the muscles, and derived it from the unequal stretching of them and of the ligaments. Scarpa, as well as Brüchner and Naumberg, believed that vicious twisting of the foot first exists, and thereby is caused an approximation of the points of insertion of some muscles, and the distancing of others from their fixed points: consequently, a shortening of the former, and an elongation of the latter. Wantzel considers club-foot as great adduction, accompanied with violent extension, whence necessarily are the corresponding consequences: and Jörg holds it as a continued adduction, become habitual to the foot. Delpech (*b*) has of late with-

(*a*) Traité des Maladies des Os, vol. ii. c. 3. (*b*) Orthomorpie, p. 117.

drawn his previous opinion that the cause of club-foot is in the form of the bones, because the muscles do not oppose a contrary direction of the foot, which is especially distinct in those cases where the shortening is accompanied with atrophy, and with a sort of palsy. He considers the congenital, or accidental shortening of the muscles, as the peculiar cause of club-foot, and, at the same time, has pointed out the retraction of the plantar *fascia*. Rudolphi, who has several times seen this deformity in the *fœtus* of from three to four months, derives it from arrest of the nervous influence, contrary to the opinion put forth by Camper and Glisson, that the club-foot arose from vicious position of the child in the womb, by which the foot was pressed on, and its development prevented; an opinion in which Cruvelhier (*a*) has participated, and Martin (*b*) has sought to ground in pressure of the womb from deficiency of the waters. Scoutetten holds the following as the causes of congenital and postgenital club-foot. 1. Unequal division of power between the extending and flexing muscles; 2. Vicious condition of the joint surfaces of the tarsal bones; 3. Vicious position of the *fœtus* in the womb; 4. Compression of the flexible joints by contraction of the womb; 5. Convulsions of the child in the womb; 6. Convulsions in early childhood; 7. Chronic inflammation of the muscles of the leg; 8. Vicious innervation, dependent on disease of the brain, or spinal marrow, without previous convulsions; 9. Contraction of the plantar *fascia*; 10. Contraction of the muscles, without discernible cause. Duval (*c*) assumes as causes of congenital club-foot, (as well as of the other curvatures,) vicious position of the foot in the womb, and disturbance of the functions of the brain and spinal marrow. Consecutive or accidental curvatures he derives from wounds, fractures, dislocations, bad holding of the foot, from inflammation, abscess, and so on. With all these causes, unequal activity of the muscles exists. Blasius (*d*) puts forth the congenital club-foot alone as the *true* one; in it the above-described symptoms are found. That occurring after birth, which usually is not so great, and is produced by wounds, ulceration, palsy of the muscles, dyscrasy, and neuralgy, is a natural extension of the foot, caused by too violent contraction of the muscles of the calf, in which the turning around the long axis of the limb follows only secondarily from walking. This he calls the *seeming* club-foot.

Club-foot is, according to Little, easily distinguishable from that deformity of the *tarsus* which is caused by rickets. The participation of the parents in the disease, the usual complication which accompanies rickets; above all, the curvature of the bones of the limbs, serve as sufficient diagnostic marks. The *pathognomonic* signs, retraction of the heel, stretching of the tendons of the muscles of the calf and the adductors, concavity of the sole of the foot, and the curvature of the inner edge of the foot are wanting.

On anatomical examination the bones appear in *varus* to be brought out of their position, without prejudice to their natural firmness, from muscular activity, and the weight of the body; in *false varus*, which arises from rickets, the bones are not only brought out of position by the weight of the body, but also compressed and misformed, in consequence of their softening.

[The following interesting case of club-foot was under my care some years ago, in which the cause was at first very doubtful, and led to several operations; but subsequently I think there could be little doubt that it was hysterical.

Case.—S. P., aged seventeen years, a stout, healthy girl, was admitted *April* 9, 1837. She has been irregular for several months, and has had three fits, but of what kind cannot be ascertained. About a month ago she went to bed seemingly quite well, and with perfect use of her limbs; but, when she awoke in the morning, her right foot was immovably fixed, with the sole turned upwards and inwards, so that when put to the ground, the limb rested on the whole length of the outer margin of the foot. This was accompanied with great pain along the course of the *m. peronei*.

At the present time the foot is firmly fixed at right angle with the leg, and the sole faces directly inwards, the *m. tibialis anticus* is in strong action, and its tendon raising the skin in front of the ankle-joint. No other tendon or muscle is unnatural.

(*a*) Anatomie Pathologique du Corps Humain. Paris, 1828-30. Ib. liv. ii.

(*b*) Bulletin de l'Académie de Médecine de Paris. 15 Nov. 1836.

(*c*) Révue Medicale, Nov. 1838.

(*d*) Klinische Zeitschrift für Chirurgie und Augenheilkunde, pt. i p. 60.

Any attempt to restore the proper position of the foot causes great pain in the course of the contracted muscle.

In the course of the two following months, a moxa was thrice applied on the calf of the leg, with the hope of stimulating the antagonist muscles to action, but without benefit.

May 18. She was attacked with pain on the inner edge of the calf of the leg, followed by a little swelling, as if the *m. gastrocnemii* were in action at that point, and accompanied with slight tenderness. These subsided in the course of a few days, and her condition otherwise remained unchanged.

June 15. A stream of cold water was ordered to be poured on her leg, from a height of five or six feet, for a quarter of an hour every morning. This was persisted in for three weeks, occasionally followed by pain; but then given up, as there was an erysipelatous blush about the ankle, which, however, soon subsided.

July 10. A moxa was put in opposite the origin of the sciatic nerve.

July 14. Complains of pain on the outer side of the calf, but more severe than before and accompanied with swelling of the muscle; these have been coming on for the last three days, and the swelling is about the size of half a walnut, tender, but not firm though very distinct.

On the following day she was electrified in the whole length of the *m. peronei*, and from them across to the *m. tibialis anticus*. This was continued daily for a short time and she fancied she could move her great toe a little.

July 21. One or two electric shocks were also passed through the region of the womb, in hope to excite it to action; but, after repetition for two or three days, was given up as it produced great pain in the *pelvis*, without other effect.

Aug. 9. The electric shocks having blistered the front of her leg, sparks were ordered to be taken daily instead. About a fortnight or three weeks after, the anterior tibial muscle certainly had yielded, and she was able to get the sole of the foot flatter upon the ground, and walk a little better. This, however, lasted only a fortnight, and the foot then gradually reverted to its old position, if not worse. The electricity was therefore given up, and nothing more was done till

Oct. 21, when the tendon of the *m. tibialis anticus* was divided two inches above the ankle-joint, with a *phimosis*-knife, and snapped with a sharp report. Motion was immediately restored, and the sole could be placed on the ground, but returned to its old position when left alone, and she then suffered great pain in the instep, and up the front of the leg, which continued for three hours. It therefore was necessary to preserve the natural position, by applying a foot-board to the sole, on the sides of which the branches of a stirrup were attached, and from its crown a rod, with a screw for adjusting its length, was carried upon the front of the leg, and fixed by a circular bandage below the knee. This apparatus did not answer the purpose, and therefore, on the following day, I put Boyer's splint on the outside of the limb with a foot piece. This was continued for more than a week, but every day the foot was found returned to its old posture, and for the greater part of the time the pain in the leg continued. At the end of the week a back-splint was put behind the length of the limb, and the top of the long splint fastened to it, to prevent it turning forward, in which position it had been daily found. This at first seemed to do very well, but it failed, though carefully attended to in the same way for a fortnight.

Nov. 15. Still nearly as great inversion of the foot as at first, but it could be restored to its proper place by the hand as easily as at first, and when let go again became distorted. The peroneal muscles do not seem to have the least power. Flexion of the foot upon the leg is much restricted, and it seems probable that the Achilles' tendon will require division.

Wishing to try whether any advantage would be attained by her attempting to walk, an apparatus was applied on the outside of the leg, consisting of an iron rod, jointed at the ankle and knee, and extending half up the thigh, with some straps round the leg and thigh, and a foot-piece at right angle with its lower end, upon which the sole of the foot was firmly bound with a roller. She was directed to move about with this, and upon crutches. The sole bears well on the ground, but the great toe turns inwards, and she has pain along the back of the leg. This plan was persevered in for ten days, the bandages being adjusted as was found necessary.

Nov. 25. On consultation with Dr. Little he thought the *m. tibialis posticus* was at fault, and I therefore divided it with a *phimosis*-knife, from behind forwards—to wit, entering the knife between the tibial and long flexor muscles of the toes, about three

inches above the ankle, and carrying the point down to the bone, cutting with it inwards. The inversion immediately subsided, and the foot recovered its natural position; a slip of plaster and a narrow roller were applied, but nothing more done.

In the evening she had pain along the inside of the shin-bone, which increased during the night, and subsided on the following morning, but came on again towards evening with severe burning, and a sensation of stretching along the front of the leg, but which entirely subsided next day.

Nov. 29. On visiting her this morning, the foot was again found a little turned in the old direction, which she herself had noticed when she first woke this morning. She complains of "a shrinking pain along the inside of the leg, very different from the stretching which she first felt on the night of the 26th; but which has now entirely ceased." The foot can be restored to its natural position without the least difficulty, but, when left alone, has still the disposition to turn in. The jointed iron rod and foot-piece were therefore reapplied, and answered well.

From this recurrence of the distortion, and the continued absence of the menstrual discharge, accompanied with headach and pain in the loins, it became questionable whether it might not really be an hysterical affection, of which indeed there had been a suspicion when she was first admitted. It was therefore determined that she should take *mist. ferri comp.* ℥jss. *ter die*, which was continued till

Dec. 16, without any benefit. It was therefore left off, and five grains of ergot of rye three times a day, with a warm foot-bath every night, were ordered. Two days after, the headach and pains in the loin were much relieved, and had ceased entirely on

Dec. 23; but no change or improvement has occurred as to the menses, or the inversion. The medicine was suspended for three weeks.

Jan. 28, 1838. The ergot resumed for a week.

Feb. 7. The ergot again. Ordered for the same period.

Feb. 24. No alteration. The foot continues turned in, but there is no disposition of elevation of the heel. It was therefore determined to excite the action of the *m. peronei* by blistering along their whole length.

March 3. A second blister has been applied, but there is no improvement; indeed, the heel is more elevated. A third blister was then put on, and the stirrup readjusted to the foot and leg. On the following day the menstrual discharge appeared sparingly, the first time for thirteen months, and continued only a couple of days.

March 31. She took a dose of the ergot, and next day the menses appeared, and continued for three days; but no recovery of the foot followed, and she left the house in

April, with the sole still turned inwards and upwards.

I saw nothing of her for several months, till I accidentally met her; and, observing she was walking well with the sole of the foot to the ground, which she informed me had recovered itself, without any farther treatment, a month or two after she had left the house, and that she was menstruating regularly.

From this account, I was led to believe that the contraction of the muscles, which had successively occurred, was hysterical, and that the operations I had performed were superfluous.

Varus sometimes occurs as consequence of palsy of the muscles of the leg during teething. I operated, in 1839, on a case of this kind in a girl, between eleven and twelve years old, in which the foot first dangled from the ankle; but, as she grew up, and began to walk, inversion commenced, and, when I first saw her, whilst standing upright, the foot rested on the whole *dorsum pedis*, except the great metatarsal bone, which faced outwards; the tuberosity of the heel-bone was raised about an inch from the ground, and its under surface faced inwards; before this bone nearly the whole sole faced directly upwards. When lifted from the ground, the foot nearly recovered the natural position; but there was still a little disposition to inversion, and the weight of the front of the foot pointed the toes. When the knee was straight, the foot could not be flexed at all on the leg; but, when the knee was much bent, the sole could be almost entirely applied to the ground. The gastrocnemial muscles were little developed, and the muscles generally did not control the foot. The Achilles' tendon was divided, and extension made; after five weeks, a steel rod, jointed at the angle and knee, and attached to a boot, was put on, soon after which she got up, and, in rather more than seven weeks, began to walk with the sole flat on the ground, with the assistance of a stick, which, in the following week she threw aside of her own accord, and walked slowly without assistance.

She would probably have improved more quickly, but that a slough formed on the skin of the tuberosity of the heel, in consequence of the foot-piece of the first applied apparatus having pressed unduly. At the end of six months she walked very well, and the treatment had perfectly succeeded.

Shortly after, I had another case of the same kind in both feet of a child, three years old, in which the same proceeding was adopted with success, as the child walked upon the soles tolerably at the end of six months, whilst wearing boots with jointed steel leg-rods. But he could not do without these, as the paralytic muscles had not recovered, although galvanism had been employed.—J. F. S.]

1373. As to the *prognosis* of this ailment, all depends on its degree and complication. If there be simply disproportion between the muscles, if the twisted bones have neither their form changed, nor are fixed in their unnatural position by *anchylosis*, a favourable issue may be hoped for; and the more if the patient be young, far distant from manhood, have no accompanying dyscrasic disease, and the nutrition of the curved foot have not suffered much. The time in which the cure of this ailment may occur is not determinable, and depends upon the mode of its treatment, in addition to its degree and duration. In adults who have walked long on their crooked feet, in which the bones are anchylosed, or considerably changed in form, their complete cure is impossible.

1374. The *treatment* of club-foot consists in the restoration of the natural antagonism of the muscles, and of the straight direction of the foot, which is effected either by lengthening the shortened muscles by means of gradual extension and mechanical contrivance, or by cutting through the tendons of the shortened muscles, and subsequently straightening the foot by the mechanical means. The first (mechanical) mode of treatment is always tedious and difficult, especially in a greater degree and longer duration of club-foot, in which case frequently it is of no service. It is indicated in slighter degrees of club-foot, when the foot can, without much trouble, be brought straight, and a constant careful oversight of the patient is possible. The division of the tendons is in all cases the most fitting, when the first mode of treatment has been without benefit, or where the greater degree and duration of the curvature has led to the expectation of its being baffled, or, from external circumstances a speedy termination of the cure is required.

1375. The treatment, by gradually lengthening the shortened muscles, is divided into the periods of *rightly directing*, *steadying the foot*, and of *walking*.

In order to bring the foot gradually into the straight direction, it is recommended to use a warm bath, in which twice daily, the foot is to be immersed up to the knee, for about half an hour, and during this time attempts made to bring the foot into its natural position, holding it with one hand, so that the thumb lies upon the back, the forefinger on the inner edge, and the other fingers upon the sole of the foot, and with the other hand placed round the heel, by which the foot, and especially the heel, is turned outwards, the front of the foot raised, and its hind part depressed. These manipulations must be carried on slowly, and for some time. When the foot has been taken out of the bath, and properly dried, lard or goose-fat is to be rubbed on the inner and hinder part of the leg and on the inner and *plantar* surface of the foot, and any spirituous fluid should be rubbed on the fore and outer part of the leg and foot. For the purpose of keeping the foot drawn towards its natural direction,

a triangular piece of cloth is used, folded to the breadth of two fingers, and about three-quarters of an ell long; it should be placed beneath the calf, carried around both ankles, from without inwards, over the back, and over the middle of the inner edge of the foot, under the sole outwards, and, by proper drawing, it bends the foot outwards. This turn being repeated, the tip of the cloth is carried from the outer, obliquely upwards toward the upper edge of the foot, and both then connected by a packer's knot upon the back of the foot, are carried around the ankle, and tied together (Brüchneu's bandage.) This cloth must be applied once or twice a day; but, as it nevertheless is easily displaced, strips of sticking plaster may be applied on the same plan, much more efficiently, for the purpose of bringing the foot into place (*a*).

In children born with club-foot, we are restricted for the first two or three months, on account of the delicacy of their skin, to frequent daily manipulation, by which it must be attempted to bring the foot gradually to its place; and subsequently the mode of treatment proposed is to be employed. Success is frequent in these cases, on account of the slight degree of the evil and the yieldingness of all the parts. A club-footed patient who has already walked, must from the very onset of the cure be carefully restricted therefrom.

Scarpa has recommended a peculiar spring for gradually bending the foot outwards; it is applied on the outside of the foot, and fastened with two straps. Repeated experience has decided me on giving up this practice, and giving preference to the sticking plaster.

[As far as I have had opportunity of observing, little real benefit is derived beyond straightening the foot, whatever bandage or apparatus be used, before the child can be put on his feet, and the weight of his body counteract the unnatural contraction, or disposition to contract, of the gastrocnemial muscles. I therefore rarely do more than, as Chelius recommends, fix the foot with sticking plaster, and, perhaps, put on a light tin shoe, with a back, to render the bandage more firm, but with little expectation of flexing the foot.—J. F. S.]

1376. When the foot has been so far managed, that it can be brought with the hand to its proper place, it is best retained there by the so-called Scarpa's second machine (1), which is applied over the stocking and worn day and night. The patient may then be permitted, gradually and upon even ground, to stand and walk. After some time, when the foot retains of itself its natural position, the apparatus may be left off during the day, but still worn at night. It is best to let the patient wear a laced boot, which should lace to the toes and have a thin steel plate at its back.

(1) Scarpa's machine consists of a shoe, the front of which is made of a thin padded shoe sole, and the back part of a steel plate (a parabolic spring) which encloses the whole heel. On the inner part of this parabolic spring is a padded strap which is drawn over the back of the foot and fastened to a stud on its outside. A horizontal spring is continued from the outside of the parabolic one to the tip of the foot, around which it is fastened by a padded strap. At the hind end of this spring is a strap fastened to a stud on the inside of the parabolic one; and from the outside of the latter a moderately curved spring, with its concave surface towards the leg, ascends up to the region of the knee, and is connected with the parabolic spring by a rivet in form of a T. Two padded straps serve for fastening it to the leg above the ankle and below the knee, which, by means of pieces of tin and screws, can be variously attached to the vertical spring. Scarpa's machine is similar to that proposed by Delpech (*b*). To it must be given merited praise and preference above all others (*c*) (2).

(*a*) Giese, Salzb., Medic.-Chirur. Zeitung, 1814. vol. iv. p. 75.
(*b*) Above cited, pl. v. vi. vii. Orthomorphie, pl. xlii.
(*c*) Meinhausen; in Gött. gel. Anzeig., 1799, p. 713; 1807, p. 2049; 1801, p. 1321.

Besides these mentioned, a number of machines and apparatus have been proposed, of which mention can only be made. Hippocrates' laced boot; the apparatus of Paré, Hildanus, and Haar; the machines of Venel Brünninghausen (*a*), of Autenrieth, of Blömer (*b*), of Delacroix, and others.

2. Scarpa's shoe is a very good instrument when the *varus* is not great, but it will effect no benefit in a bad case; nor will any other; and division of the tendon, or tendons, will be requisite to produce a cure. I may mention, that where I have seen it used, the child walks on his heels, and in spite of the spring, the gait is that which is so well known as resulting from what is called *pigeon toe*.—J. F. S.]

1377. The subcutaneous division of the tendons for the more speedy restoration of the position of the foot especially applies to the Achilles' tendon, the tendon of the *m. tibialis anticus*, and the plantar *fascia*. The Achilles' tendon generally offers the greatest hindrance to the proper direction of the foot; its division alone is in many cases sufficient, or only in the after-treatment is the necessity for the division of the other tendons declared; often, however, on first examination the necessity for the simultaneous division of both is shown by the great stretching which the other tendons present. Besides those mentioned, I have, even in the most severe degree of club-foot, never found it necessary to divide any other, although the division of the tendons of the *m. tibialis posticus* and of the *m. flexor longus pollicis* have been considered necessary and performed by others; and Stromeyer, who has frequently cut through the tendon of the *m. tibialis posticus*, himself admits that from the result of his observations on the division of this tendon no decisive influence upon the restoration of the form and function of club-foot is to be ascribed to it.

1378. The division of the Achilles' tendon is performed most simply and effectually in the following manner. The patient is laid upon his belly, the leg held by one assistant and the foot pressed in its natural direction by another, so that the Achilles' tendon may be tightly strained and very prominent; the thumb and fore-finger of the left hand are then to be placed on both sides of the tendon to fix it and the skin covering it, and then a narrow *slightly* convex and pointed bistoury (1), held flat, is to be thrust in at the inner side of the tendon and directly behind it, about two inches above the heel, beneath the skin, without penetrating it on the outer side, and then the edge of the knife being turned towards the tendon, cuts it through (whilst the flat of the thumb of the left hand placed upon the tendon presses it against the edge) with one or more strokes, without injuring the skin. At the moment of the complete division of the tendon a crack is heard, the two ends of the tendon separate more or less widely asunder, and the foot inclines in the same proportion to its natural position. As soon as the knife is withdrawn slight pressure should be made with the thumb against the little wound, to squeeze out the blood and to prevent the entrance of air; the wound is to be covered with some strips of sticking-plaster and wadding, which are fastened with some turns of a lightly-applied roller. The patient is then to be carried to bed, and the foot placed in a suitable position.

(*a*) Richter's Chirurg. Bibliothek, vol. xv. p. 566, pl. i. f. 1, 2, 3.

(*b*) B. Bruns, Dissert. de talipede varo. Berol., 1827.

Thilenius (*a*), Michaelis (*b*), and Sartorius (*c*), cut through the tendon simultaneously with the skin. Delpech thrust the blade of a bistoury behind the Achilles' tendon, so that on both sides a skin wound is produced about an inch long; a convex knife is then introduced, with the edge of which towards the tendon he divides it transversely, without wounding the skin above it. Stromeyer thrusts in a narrow curved fistula-knife about two inches above the heel, behind the Achilles' tendon, and out at the other side, and cuts through it in withdrawing the knife. Stoess makes with a narrow double-edged bistoury, which he thrusts in flat behind the Achilles' tendon, a wound two and a half inches wide, without perforating the skin on the other side, draws the bistoury back, and introducing a button-ended one, slightly curved, and cutting on to a slight extent, with which he divides the tendon. Bouvier (*d*) makes a slight puncture in the skin with the point of a lancet, a few lines before the tendon, where it is thinnest and strongest, and introduces through this puncture a straight narrow button-ended tenotome between the skin and tendon, and cuts through from before backwards. Guerin brings his narrow tenotome, slightly rounded in front, through a previously made small skin-wound beneath the tendon. Scoutetten stretches the skin with the fingers of the left hand, at the same time drawing it somewhat inwards and thrusts in the tenotome at the inner side of the tendon, carrying it from behind forwards and from within outwards, without penetrating the skin on the opposite side; he now depresses the handle, draws the knife backwards and forwards, and the tendon is divided. Dieffenbach and others practise in the above-mentioned way.

[(1) I never use any other than a common *phimosis*-knife, which I pass flat *before* the tendon, till I can feel its point against, but without penetrating the skin on the outside of the leg; then turn the edge to the tendon, which being made tense by an assistant, and pressed against the knife with the left thumb, I cut through with the end of the knife as I withdraw it.—J. F. S.]

1379. When after from three to five days the little wound has closed, the return of the foot to its natural position is to be set about with a machine, which gradually effects the necessary apparent change of position. Stoess' apparatus best answers this purpose. The return of the foot to its natural place ensues more quickly or more slowly according to the degree and duration of the curvature; all violence must be avoided, and by the *gradual* reinforced degree of extending the foot and proper soft pads, all painful pressure and excoriation are to be avoided. When the foot is brought to its natural position, Scarpa's apparatus may be applied and the patient allowed to walk. The movements of the foot are at first uncertain and stiff, but they improve by exercise, and in similar proportion does the atrophic condition of the muscles diminish, to which end rubbing at the same time with spirits may somewhat contribute.

Delpech's apparatus, (*e*), Stromeyer's (*f*), Scoutetten's (*g*), and Pauli's (*h*) are also used for this purpose. Pauli, when after two or three days the little wound is healed, surrounds the foot with a mould of plaster of Paris, which he makes in a sort of jointed wooden boot, and leaves to harden. If the proper position of the foot cannot be at once effected, he renews it frequently(1).

In not very great curvature, the foot often at once, after the division of the Achilles' tendon, can be restored to its natural position, and in these cases the extending machine may be at once applied. In most cases, however, this is impossible, or pain, inflammation, and so on, are too easily excited by the extending force;

(*a*) Medicinische und chirurgische Bemerkungen. Frankf., 1789. p. 335.

(*b*) Ueber die Schivachung der Sehne durch Einschneidung, als einem Mittel bei manchen Gliederverunstaltungen; in Hufeland's and Himly's Journal, vol. vi. Nov. 1831, p. 3.

(*c*) Siebold's Sammlung seltener und auserlesener chirurgischen Beobacthungen, vol. iii. p. 258.

(*d*) Bulletin de l'Académie de Médecine de Paris, December, 1836.

(*e*) Above cited, pl. ix.

(*f*) Pl. iii.

(*g*) Pl. vi.

(*h*) Above cited, fig. 1.

it is therefore best to commence the setting straight first when the little wound has healed, (Stromeyer, Dieffenbach, Stoess, myself and others,) (2), and not immediately after the operation (Thilenius, Michaelis, Sartorius, Delpech, Bouvier, Pauli, Duval, Blasius.)

[(1) When I first began to operate on cases of *varus*, I had not any opportunity of either being acquainted with or seeing Stromer's apparatus, which I think is by far the best instrument for treating these cases I know of, and I used Boyer's splint for fractured thigh, with the shoe, which I first fastened on the foot, and then having fixed it upon the projecting bar, gradually from day to day, drew down the upper end of the splint to the plane of the thigh-bone as the patient could bear it; for although when the shoe was firmly fixed, the length of the splint was so great, that it produced such powerful leverage as to overcome every resistance to placing the foot immediately in its proper position, yet I was afraid of attempting it at once, on account of the violence which would have been needed, and the pain the patient would have suffered; for even in the way I used it, the patient suffered considerably, from the stress of the shoe-straps, and constantly sought to relieve himself, so that almost daily the foot was found more or less displaced, however well it had been arranged on the previous day, and therefore the progress of the cure retarded.

I therefore altered my plan, and instead of at once attempting to turn the sole down and flex the leg upon the foot, I first endeavoured to get the foot straight with the leg, leaving the toe pointed, and the heel raised, or in other words, to convert the club-foot into horse-foot, and afterwards gradually to flex the foot on the leg from day to day. The first part of the proceeding was affected by Boyer's splint and shoe, with the simple alteration of making the foot-bar, upon which the shoe was fixed, round instead of square, so that when the bar was entered into its socket, the sole of the foot was readily turned down without making any flexion upon the leg, the socket moving on the bar as the toe pointed, which it is always first disposed to do after the division of the Achilles' tendon. After a few days, when the patient had become accustomed to this new position, I began gradually to flex the foot on the leg, by slipping the foot-piece into the foot-piece of the stirrup apparatus for fractured knee-cap, the circular bandage of which was fixed above the knee, and then gradually shortened the screw rod as the patient could bear the stress upon the ball of the great toe, which was considerable. This answered the purpose, but it was a very clumsy contrivance, and I soon managed to contrive a more simple and efficacious instrument, which consisted of a pair of long narrow splints, like Boyer's splint, one for the outside, and the other for the inside of the leg and thigh, which were connected at bottom by the circular bar on which the foot-piece moved, and upon the leg and thigh, by three or four straps and buckles. For flexing the foot, a stud was placed on each edge of the foot-piece, near its toe end, upon each of which a leather strap fastened, by which the toe end of the foot-piece could be drawn up, and, the foot flexed on the leg, to such extent as might be wished; and this being determined, the other end of each strap was fastened on a stud in the side of the corresponding splint upon the thigh.

This apparatus I have used very frequently and successfully, and with children it serves every purpose required, if the surgeon be content to restore the straight position of the foot first, and afterwards to flex it. The instrument has the advantage of being easily made by a common carpenter and smith, and with little expense, even if a new one be made for every case treated. I do not presume to put it in competition with Stromeyer's excellent apparatus, which cannot always be obtained when required, is expensive, and needs some little practice for its proper employment. It is, however, a most capital instrument, and effects at the same time the flattening of the sole and the flexion of the foot with little more than a feeling of confinement to the patient, if it be properly adjusted.

(2) I fully agree with those who prefer leaving the limb at rest for a few days after dividing the tendon; as the patient then bears the extension with less pain. I first began by putting the limb in place at once after the operation, but finding it often necessary to slacken the bandages, I gave it up, and pursued the other practice with greater satisfaction.—J. F. S.]

1380. If there be present with club-foot, considerable bending of the toes, and great concavity of the sole of the foot, in which case the plantar *fascia* is stretched like a cord in attempting to extend the foot, the divi-

sion of that *fascia* is necessary (1). If the foot be strongly drawn inwards, and the curving of its outer edge be so considerable that the great toe and the inner edge of the foot are much contracted, then the tendons of the *m. tibialis anticus* and *extensor proprius pollicis* must be divided. In greater bending inwards of the foot, so that it can only with the greatest force be moved towards the horizontal axis of the shin-bone, the tendons of the *m. tibialis posticus* and *extensor proprius pollicis* must be cut through.

In dividing the plantar *fascia*, the heel and toes should be strongly drawn asunder by an assistant, by which the *fascia* is still more stretched and projected, the knife is to be introduced, flat on the inner edge of the foot under the *fascia*, its edge should then be turned and the *fascia* cut through as it is withdrawn, without injuring the skin on the opposite side, which I have often done with ease. The tendon of the *m. tibialis anticus* may in this way be divided at the lower end of the shin-bone, where it projects very greatly beneath the skin; also the tendon of the *m. extensor pollicis proprius*, to the outer side of which the anterior tibial artery lies, and may be easily avoided. The division of the tendon of the *m. tibialis posticus* is made half an inch above the inner ankle; the nail of the left fore-finger is to be placed over the posterior tibial artery, and the point of a curved knife carried to the bone, and forwards upon it, divides the tendon (2). A cut three-fourths of an inch long is made more conveniently along the course of the tendon above the inner ankle; the foot is then turned outwards, and the exposed tendon divided with the point of a knife (Stromeyer.) The tendon of the *m. flexor pollicis longus* is cut through near the inner edge of the foot, where when violently stretched, it projects between those of the *m. flexor pollicis brevis* and of the *m. adductor pollicis*, beneath the skin, without thrusting the knife out at the other side.

[(1) Shortening of the inner portion of the plantar *fascia* producing great diminution in the length, with considerable elevation of the inside of the arch of the foot, in which case, the great toe generally stands almost upright, instead of resting horizontally on the ground, I have seen several times, independent of any disposition to club-foot. I have usually cured it without difficulty, by thrusting a *phimosis*-knife on the inside of the foot, opposite the base of the great metatarsal bone, between the skin and *fascia*, and dividing the latter in withdrawing the knife. No apparatus is requisite, but after three or four days, when the weight of the body can be borne, the patient is to be directed to walk about a little, so that the newly-formed connecting matter is gradually lengthened, and the arch of the foot drops to its natural level; the great toe also at the same time recovers its place.

(2) The division of the tendon of the *m. tibialis posticus* is the only one which requires much anatomical knowledge or, care, on account of the close neighbourhood of the posterior tibial artery, which I once divided in performing this operation on a child; it bled very smartly for a few minutes, and having enlarged the wound, I attempted to take it up, but the ends had retracted so much, that I could not succeed, and therefore thought best to bring the edges of the wound together and apply a compress. Union took place, and no hæmorrhage occurred. I have been told that such accidents are not very unfrequent, and that no inconvenience follows; but there can be no doubt it were better avoided.—J. F. S.]

1381. If the patient be kept quiet, ordinarily no important symptoms come on; I have not, at least, observed any in my own practice; and if they occur, they would depend rather on the patient's constitution than on the operation itself, if properly conducted. Should inflammation ensue, and if it be not dispersed by cold applications, the *pus* must be early

evacuated, and by proper treatment the extension of the suppuration and exfoliation of the tendon prevented. If unfavourable symptoms occur after this operation, and if in some cases of old and very considerably curved club-foot the result of this operation be not perfect, or even not considerable, and which indeed cannot be previously ensured, yet they do not damage the value of this operation. Even in the earliest childhood it may be employed.

Blasius supposes that the operation, when applied to true club-foot, that is, to severe cases, where it alone can be preferred, effects little or nothing; that it rather only applies to spurious club-foot, and especially to slight cases. Club-foot is a complication of anomalies: and that the inversion is the most important point; but the operation is directed against only one anomaly, and not at once against the most important. Many groups of muscles participate in the vicious position; the operation is only directed against the muscles of the calf,—at most against the *m. tibialis anticus* or some one of the others. Atrophy of the leg is always present, and against it can the operation be of no use. This opinion is contradicted by what has been already said, and by the experience both of others and myself. Against Blasius's opinion of the propriety of amputation in such states of club-foot, compare Stromeyer (*a*).

b.—OF SPLAY-FOOT.

(*Valgus*, Lat.; *Plattfuss*, Germ.; *Pied-plat*, Fr.)

Buchetmann, Inaug. Abh. über die Plattfuss. Erlangen, 1830; with plates.
Nevermann, Ueber den Plattfuss und seine Heilung; with a plate; in Hamburger Zeitschrift, vol. iv. part ii. 1837.
Stromeyer, above cited, p. 99.
Dieffenbach, above cited, p. 127.

1382. *Splay-foot*, the reverse of club-foot, is a frequently occurring deformity, in which there is not any actual twisting, but rather only such inclination of the foot outwards that the inner ankle projects very much and descends lower than natural, that beneath the outer ankle is a more or less deep depression, the natural arching of the back of the foot and the cavity of the sole and of the inner edge of the sole are lost, and the foot touches the ground at once with the whole sole, and is widest at the *tarsus*. Generally the foot is unusually cold, dusky-red or bluish, as if frost-bitten, but, however, much disposed to sweat, so that it is always moist; the skin of the sole is soft, and without the usual hardness and callosities. In walking, splay-footed persons direct the knee inwards and the foot outwards, so that they mostly tread on the inside of the foot.

1383. The inconveniences in splay-foot are, speedy fatigue in walking, swelling of the foot around the ankles, and soreness of the soles of the feet, on which account persons so affected are not fit for military service in the infantry. From the continual straining of the feet, even chronic inflammation of the ligaments and synovial membranes arises, by which not merely pain but also serous exudation among the tarsal bones takes place. This requires rest, by which the transition to *caries* is prevented (Stromeyer). It is remarkable that affections of all kinds arising on the feet or legs of splay-footed persons, especially inflammation and ulcers, are always remarkably stubborn.

(*a*) Casper's Wochenschrift, 1836. Nos. 34, 35.

Splay-foot must be distinguished from *Broad*-foot which is simply an enlargement of the natural form of the foot dependent on the extension of the lateral ligaments, attached to the metatarsal bones, caused by their frequent use (*a*).

1384. Splay-foot is either congenital, and shows itself in different degrees directly after birth, as I have several times noticed, in which there is unyieldingness of the *m. peronei*, especially of the *m. peroneus longus*, and the ailment is certainly caused by the position of the child in the womb; or it is developed later, rarely in the female sex and in children under ten years. There is probably a congenital disposition in the position of the tarsal bones, or atony of the plantar *fascia* and tarsal ligaments, where first, at a subsequent period, and from straining in standing, walking, and so on, splay-foot is developed, and the heel-bone is so twisted inwards that its outer surface inclines more upwards, and the inner more downwards at the same time. The position of the other tarsal bones and their joints is little changed; the head of the *astragalus* and cuboid bone often project rather more inwards. In many families, especially among Jews, splay-foot is hereditary. Continual standing, especially with bare feet upon the damp ground, and much work influence its development. In the higher classes splay-foot very rarely occurs.

As to the causes of splay-foot, which have, however, only recently been attentively noticed, opinions are different. According to Liston (*b*) the ailment arises from a thickening (*exostosis*) of the distal end of the first metatarsal bone, in consequence of blows, rheumatism, gout, and scrofula, in opposition to which Froriep (*c*) correctly observes, that this is only an accidental complication of splay-foot. Rognetta (*d*) holds congenital splay-foot consequent on deficient development of the heel-bone, and the acquired, as consequence of relaxation of the ligaments of the tarsal bones. Thune (*e*) lays the cause in a twisting round of the heel-bone, so that its outer surface is turned upwards, and its inner one somewhat inwards. The firm connexion between the heel-bone and *astragalus* by their unyielding ligamentous apparatus, cause a similar change in the position of the *astragalus*. If deformity be added, it is accompanied with subluxation between the articular surfaces of the head of the *astragalus* and the navicular bone, in which case the tuberosity of the latter sinks lower than the front part of the head of the former, which is itself sunken. The ligaments, especially the dorsal ligaments, between the *astragalus* and navicular bone, but still more, the plantar ligaments, and most of all, those between the two bones are very much stretched. The front fibres of the deltoid ligament and *ligamentum fibulare tali anticum*, are also considerably stretched, as the shin-bone rests only on the hindermost part of the upper joint-surfaces of the *astragalus*, and thereby the navicular bone is removed more forward and the splint bone more outwards from the navicular bone. Stromeyer places the cause of splay-foot in atony of the plantar fascia and of the tarsal ligaments. As these yield to pressure, the foot loses its arch, and contrariwise inclines outwards, because the action of the tibial muscles and of those of the calf, which properly press the outer edge of the foot and the ball of the great toe against the ground, in less strength of the ankle-joint, urge the shin-bone inward, which at the same time is accompanied with a driving forwards of the same bone. Atony of the leg is not to be considered as one of the causes in splay-foot; for in some degree of bad cases all the muscles are in such stretched condition that it cannot be ascribed to atony.

Thune (*f*) distinguishes *primitive* and *secondary valgus*. The former is already fully developed at birth, and accompanied with a stretching of the muscles on the

(*a*) The Circular to the Prussian military physicians, showing the difference of Broad and Splay-foot, in reference to the examination of recruits; in Rust's Magazin, vol. v. p. 1.

(*b*) Lancet, March, 1835.

(*c*) Chirurg. Kuptert. pl. 339.

(*d*) Archives générales de Médecine, 1834.

(*e*) Nevermann, above cited.

(*f*) Nevermann, above cited.

fore and outer part of the leg, which increases and becomes painful if it be attempted to put the foot straight; but the foot itself is not deformed. *Secondary valgus* occurs long after birth, after the patient has been accustomed to walk, and is constantly accompanied with a change in the form of the foot. Thune has endeavoured to ground this distinction on the different appearances in the one or other form. In *secondary valgus* the axis of the foot is on its outer edge, concave externally. The inner ankle and the navicular bone form a projection, which, in walking, always more nearly approaches the sole, so that the *valgus* is in the highest degree *talipes*; the heel and the outer edge of the foot are away from the ground; the Achilles' tendon lies concealed behind the fold of the skin, and is felt removed somewhat to the outer side; the heel is drawn upwards; the outer *malleolus* lies concealed in the ankle-joint; the leg, in consequence of wasting, is equally thick below and above, so that the knee appears as if deformed; the back of the foot (instep) is very much arched; and walking is performed generally not with bended knees. In splay-foot the axis of the foot is not changed, the ankle is very prominent, is lower than usual, and touches the ground; the whole sole of the foot touches the earth; below the outer ankle a cavity is formed, the depth of which depends on the degree of the deformity; the heel cannot be drawn up; the outer ankle is distinctly felt; the muscles of the calf are not greatly wasted; the back of the foot is not properly arched, but has at the *tarsus* an unnatural flattening and breadth; walking is generally performed with the knees bent. This distinction, however, depends on no actual difference, but is only consequent on simultaneous contraction of the muscles, that is, those of the calf, and on shortening of the Achilles' tendon; therefore, in such cases, the division of that tendon may be sufficient (*a*).

1385. In slighter degrees of splay-foot, and in young persons, the foot may be rubbed twice a-day with spirituous fluids, then wrapped up in a bandage, moistened with spirits of wine; cold baths are to be taken from time to time, or a laced leather stocking worn, which equally encloses the foot and leg, and a shoe, with a strong tin plate, which is convex from behind forwards to the metatarsal bones. According to Dupuytren, a shoe, with a flexible elastic sole, and raised in height from half to three-quarters of an inch; according to Rognetta, a raised shoe, together with swathing the foot in a bandage moistened with camphorated spirit, which is to be looked to and tightened twice a-day; according to Stromeyer, a boot, in the middle of which a piece of leather is fastened, confining the middle of the foot from below, upwards, and from within, outwards, then runs pointed, and is fastened by a slit in the upper leather at the outside of the foot, to a buckle. In weakly persons an internal strengthening treatment is at the same time proper. In old persons, and in a high degree of splay-foot, exutories are to be kept long to the sole of the foot, blisters upon its inner edge and on one part of the sole, and suppuration kept up by acrid ointment, for the protection of the foot-swathing, and a laced boot (Stromeyer.)

Liston recommends a plaster of mercury and iodine to the swelling of the front end of the first metatarsal bone, and if this be insufficient, the head of the bone is to be removed with cutting forceps.

If the splay-foot be great and dependent on diseased contraction of the muscles, against which mechanical assistance is fruitless, Heyd (*b*) proposes dividing the *m. peronei* and indeed the tendons of the *longus* and *medius*. The *peronei* contained in a common sheath are most prominent from four to six lines above the outer ankle; a double-edged bistoury is to be introduced flat beneath them from behind forwards, and the edge turned against them. The tendon of the *m. peroneus medius* has here still some muscular fibres. The tendons of these muscles are enclosed in proper sheaths from four to six lines under or before the ankle, but they lie so close together that they can be divided at the same time, as the knife is introduced between them and the heel-bone, from above downwards, and somewhat from before, backwards.

(*a*) Stromeyer's case, above cited, p. 95. (*b*) Above cited, p. 63.

The tendons of the *m. peroneus medius* may be divided also four or five lines from the base of the fifth metatarsal bone.

[In the cases of splay-foot which I have seen, the cause of the mischief appears to have been principally in the inner plantar, or calcaneo-navicular ligament; and it is generally accompanied with tenderness in this neighbourhood. I have usually directed repeated leeching till all tenderness had subsided, and perfect rest; but the relief has only been temporary.—J. F. S.]

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c.—OF HORSE-FOOT.

(*Per equinus*, Lat.; *Pferdefuss*, *Spitzfuss*, Germ.; *Pied équin*, Fr.)

Jörg, Ueber die Verkrummungen, p. 77.
Zimmerman, Der Klumpfuss und Pferdefuss. Leipzig, 1830.
Dieffenbach, Bonnet, and Phillips, above cited.

1386. *Horse-foot* is that malformation in which the whole splay-foot has one and the same direction with the leg; the heel is considerably drawn up, so that in walking the patient only treads with his toes, and especially with the ball of the great toe. The Achilles' tendon is very tense, the foot at the same time so arched that the convexity of the back and the concavity of the sole are increased. In the greatest degree so complete a turning about of the foot may be produced, that the tip of the foot is turned backwards, and the patient walks entirely on the instep (*a*).

1387. The cause of this ailment lies in an unnatural contraction of the muscles of the calf; subsequently also the *m. plantaris* and plantar *fascia*, the *m. tibialis posticus* and *peroneus longus* shorten, and the curvature is increased. In a very high degree of this ailment the joint surfaces of the *astragalus* are so far pushed forward, that they are nearly out of contact with the shin-bone, which rests almost entirely upon the back part of the heel-bone; however, it is frequently observed that in long continued and severe horse-foot, the tarsal joints are not particularly changed, but that there is a considerable removal of the front ends of the metatarsal bones from their connexion with the toes, inasmuch as they bear the chief weight in walking, in consequence of the toes being so much turned upwards.

Horse-foot is congenital or acquired; the latter is most common, because, if at a time when the Achilles' tendon is shortened the ankle-joint have not yet attained sufficient firmness, partly from the deficient development of the ligaments, partly from that of the ankles, and especially of the inner, club-foot is quickly produced by the simultaneous shortening of the *m. tibialis anticus* and *posticus*. Some inclination of the foot inwards is, however, frequently observed in horse-foot. Diseased change in the tarsal bones may also give rise to similar displacement.

1388. In reference to the causes, all that has been said in general, and on club-foot applies here (1).

The *treatment* consists in the employment of baths, relaxing rubbings of the contracted muscles of the calf and their tendons, in manipulations,

(*a*) Stolz, Mémoire sur une variété particulière du Pied-bot; in the Journal de la Société des Sciences de Basklim. Strasbourg, 1826, vol. iii. p. 458.

for the purpose of bringing down the heel and raising the front of the foot, which position must be maintained by the apparatus of Jörg (*a*), Stromeyer, Stoess, and others. In a great degree and long continuance of horse-foot, no perfect cure is effected by this treatment, even though it be long persisted in; and the only division of the Achilles' tendon and the subsequent application of proper apparatus, as in club-foot, in a short time can restore the straight position of the foot. If the back of the foot (instep) be very much arched and the plantar *fascia* stretched like a cord, its division is mostly necessary. Stromeyer also cut through, in some cases, the tendons of *m. flexor longus* and *extensor pollicis*, on account of a permanent improper position of the great toe.

Jörg's apparatus consists of a shoe like that of Scarpa's for club-foot; on the outer side of which an iron rod ascends to the knee and is fastened round the leg with a strap. At the lower part of this rod is a spring furnished with a stop-wheel, to which an iron rod is attached, which runs forwards along the foot. A strap carried round the front of the foot is affixed to the end of this rod, by which the foot is always drawn up (2).

[(1) Among the causes which produce permanent contraction of the gastrocnemial muscles and consequent horse-foot, may be enumerated ulceration, of which I had a good case in 1837, in a strumous girl, whose heel was raised four inches from the ground, the muscles being much shrunk in the calf, and the scar of the skin closely connected with them. The motions of both knee and ankle being perfectly free when the knee was bent, I divided the Achilles' tendon, and she was cured completely.

I had also, in the same year, a case of horse-foot under my care, which followed a palsy of the left arm and leg during teething, first at ten months, and next at two years of age, from which, however, when three years old, the patient had recovered so far as to walk about with the aid of a stick or crutch; and when about sixteen, he was able sometimes, to walk even without a stick. Towards the end of the following year the heel began to leave the ground, and slowly rose still higher till he was twenty years old, when it was at least four inches from the ground, and had so continued when I saw him a twelvemonth after, (*Sept.* 1837,) the *tarsus* and *metatarsus* being then on the same plane as the front of the leg, and the foot resting only on the ball of the great toe. The foot was livid and pappy, and when lifted off the ground, dangled at the ankle-joint, both flexor and extensor muscles appearing to be paralysed. Although, under these circumstances, relief from division of the Achilles' tendon seemed to be very doubtful, I thought it worth while performing the operation, so that the sole might be brought to the ground, and then that attempts might be made to excite the muscles on the front of the leg, to action. The tendon was therefore divided in the usual manner on *Sept.* 30, which brought the sole again flat, its position was preserved by the stirrup and rod attached to a circular knee-strap, and the foot was gradually more flexed by shortening the rod as he could bear it. After wearing this apparatus six weeks, the foot, on its removal, was found still to drop, but not to the same extent. He was directed to try to move about on crutches, and to throw some of the weight of his body upon it; but the attempt produced severe pain in the muscles of the inside of the leg, which lasted a few hours, and then subsided. On the following day the muscles in the anterior tibial region were electrified for about a quarter of an hour. The foot however still dropping, the stirrup was reapplied; and five days after he was able to bear upon the foot, wearing the stirrup, without pain. About a month after he left the house, the sole of the foot was then flat on the ground, and the foot itself at right angle with the leg; but the muscles in the anterior tibial region were still wanting in tone. I have seen him several times since; the operation has succeeded so far as recovery of the position of the foot is concerned, but the muscles have not regained their power, and he is obliged to walk with a stick or crutches. The result of this case, as well also as of those *vari* already mentioned as following palsy from teething, led me into two or three instances to try the effect of dividing the Achil-

(*a*) Above cited, pl. vi.

LES' tendon where horse-foot was just beginning in children so paralysed, but no benefit was gained.

(2) The apparatus I have described for the treatment of club-foot, (*par.* 1379, *note*,) or even the fractured *patella* stirrup, will answer very well for drawing and fixing up the foot in a proper position. Indeed, this distortion of the foot is the most easy of treatment, and might be managed by a careful person merely with a shoe having tapes or straps fixed to its front, and fastened above on either side of a circular bandage above the knee.—J. F. S.]

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d.—OF HOOK-FOOT.

(*Talus*, Lat.; *Hakenfuss*, Germ.; *Pied-bot calcarien*, Fr.)

1389. *Hook* or *Heel-foot* consists in the tip of the foot being directed upwards and its back towards the front of the shin-bone, so that the foot forms an acute angle with the leg, often even rests on the shin-bone, and in stepping, the heel only touches the ground. This deformity is always congenital, and manifestly consequent on the position of the *fœtus* in the womb. Often immediately after birth, when the foot is very much drawn up, even if, as I have frequently noticed, it lie upon the shin-bone, it may be brought, by slight force, into its proper place. The contracted muscles are the *m. tibialis anticus*, *extensor proprius pollicis*, and frequently the *m. extensor communis digitorum pedis*, the tendons of which form cord-like projections beneath the skin when the foot is properly placed. The joint connexion between the heel and cuboid bone, and the *astragalus* and navicular bone appear to suffer most; but the cuneiform bones are also drawn back and their joint-surfaces separated from each other in the sole of the foot. The point of the foot is also at the same time often turned outwards if the *m. extensor communis* act violently.

1390. In all the cases which I have hitherto seen soon after birth, it was easy to bring the foot straight, and by means of a curved splint, fastened with a bandage on the front of the leg and back of the foot, to keep it so, and in a short time to effect a cure. If the ailment be permanent and the contracting muscles opposed, this treatment, or the application of a suitable splint, in which case a more considerable atrophy of the leg shows itself than in other curvatures, the division of the stretched tendons, where they project most considerably under the skin, is more certainly efficient.

[Of this disease in an incipient state, I saw the following example under my late colleague TYRRELL, originating in accident and accompanied with severe and constant pain.

CASE.—E. G., a tall bony spare widow of forty-six years was admitted *Oct.* 24, 1835. A twelve month since she had thrown down a table, the edge of which struck her right foot across the heads of the metatarsal bones, and caused violent pain and swelling. Leeches and poultices were used without relief of the pain, and six weeks after the accident all the toes began to stand upright, which disposition increased; and when she left her bed a fortnight after, she was unable to put the whole sole to the ground, and could walk only on the heel, as she suffered acute pain along the middle of the sole, with pain in the instep, as if a cord were stretched over it, and shooting pain up the front of the leg as high as the knee. For the last six months the pain has been so severe that she has not been able to put her foot to the ground, but has walked on crutches; and once came into the

hospital with the purpose of undergoing amputation, which however the surgeon who attended her did not think justifiable. At present the foot is fixed at right angle with the leg, and all the toes raised at nearly right angles with the instep; all the tendons of the muscles in the tibial region have started and are very tight. She has great tenderness on the inside of her sole and heel, and across the under surface of the heads of the metatarsal bones, but no pain on the outer edge of the sole. There is great pain in the great toe, but not in the others. Pressure along the course of the anterior and posterior tibial and outer cutaneous nerves, to within a hand's breadth of the tubercle of the shin-bone, causes great pain which shoots up into the knee.

As it was thought that these symptoms were produced by the injury which the branches of the anterior tibial nerve had received at the time of the accident, and that she was probably in a condition similar to that of a horse with lame foot, for which Sewell of the Royal London Veterinary College had some years since cut out successfully a portion of the nerve going to the foot, by which its sensibility had been destroyed, and the foot again rendered fit for work, it was determined to perform a similar operation, and accordingly, on

Nov. 6, a cut was made about a hand's breadth above the ankle-joint between the *m. tibialis anticus* and *m. extensor proprius pollicis*, and the nerve being found and carefully separated, an inch of it was removed. She suffered extremely whilst the nerve was being disturbed, but after its division the pain ceased, and the instep felt numb. The edges of the wound were brought together with plaster. She passed a good night, and on the following day was entirely free from pain, except slight pain in the great toe. On the third day, the toes had partially dropped towards their natural position, and on the following day were still straighter, and the great toe was numb. As there was a slight erysipelatous blush about the wound, the dressings were removed and a poultice applied. On the fifth day, a smart arterial bleeding, said to be to the amount of twelve ounces, followed the removal of the poultice, but stopped by pressure for ten minutes, and afterwards a compress of lint was bound on the wound. A slight oozing, however, continued, and on the following evening, bleeding recurred, and a similar quantity of blood was lost; it was temporarily restrained by pressure and the wound having been cleared by blood, an aneurysm-needle was passed beneath the anterior tibial artery, which was then tied with a single ligature.

Unfortunately after this time my notes fail, and I cannot get any satisfactory information, except that the woman did not undergo any second operation, and that she left the house four months after still upon crutches, but under what circumstances I cannot ascertain.—J. F. S.]

II.—OF CURVATURES OF THE UPPER LIMBS.

[These curvatures, excepting the fingers, are much less frequent than those of the lower limbs.

A.—OF CURVATURES OF THE SHOULDER.

These are of very rare occurrence, the weight of the arm constantly preserving its position close to the side, and antagonising any of the larger muscles by the contraction of which, alteration of its ordinary situation could be effected. In the contraction of the shoulder the arm is therefore pinned to the side, and the treatment consists merely in the application of blisters, or other irritating remedies for the purpose of inducing absorption of the interstitial deposit originating in rheumatic, or other inflammation of the soft parts about the joint; and the cautious use of extending apparatus, or passive motion, as the case may be.

The division of the tendons, as performed by DIEFFENBACH for the replacement of a long unreduced dislocation at the shoulder-joint, might certainly be applied to cases of contracted shoulder, but I should think little advantage could be hoped from it.

B.—OF CURVATURES OF THE ELBOW.

Curvatures at this joint, although very commonly resulting from *anchylosis*, or inflammatory deposit in the soft parts about the joints, are, in rare instances, consequent on contraction of the *m. biceps flexor cubiti*, and *m. brachialis anticus*. If arising from the former muscle, any attempt at extending the arm throws its tendon up, as it passes over the front of the elbow-joint, in form of a cord; by which the nature of the ailment is distinctly indicated.

If rubbing and passive motion, and the extending apparatus be unavailing, it will be necessary to divide the tendon of the *m. biceps* beneath the skin in the same way as the ACHILLES' tendon is divided, and afterwards to apply either a simple splint on the front of the whole length of the arm, and with a bandage to straighten it gradually, as the patient can bear it, or to make use of the extending apparatus.—J. F. S.]

C.—OF CURVATURES OF THE HAND.

1391. Curvatures of the hand are more rare than those of the foot, and mostly depend on unnatural activity of the muscles. There is either permanent bending of the wrist-joint, with simultaneous pronation or supination, or permanent straightening, or the fingers are permanently bent.

a.—OF PERMANENT BENDING OF THE HAND.

1392. In *permanent Bending*, the hand forms with the fore-arm a more or less right angle, and is at the same time in a state of increased pronation and adduction, or of increased supination. In both cases the fingers are strongly bent. The bones and ligaments of the *carpus* are separated from each other and outspread behind, but in front (volar surface) are contracted, and form a depression. The hand and fore-arm are more or less atrophic.

LODE (*a*) distinguishes these two kinds of curvature of the hand, *Talipomanus flexor pronata seu Talipomanus vara* and *Talipomanus flexor supinata seu Talipomanus valga*. All the muscles which bend the whole hand and fingers, and increase the concavity of the hand, in the one case, the pronators, and in the other, the supinators, are contracted at once.

1393. This curvature of the hand may be congenital or acquired. As to its causes, all that has been said upon club-foot applies. I have noticed curvature of the hand as a congenital deformity, once accompanying club-foot and once with horse-foot on the same side. The

(*a*) Above cited.

treatment must be conducted entirely according to the rules laid down for club-foot.

A proper apparatus for straightening the hand is found in Lode, fig. 3.

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b.—OF PERMANENT STRAIGHTENING OF THE HAND.

1394. *Permanent Stretching of the Hand*, in which his back is retracted, in a greater or less degree, towards the fore-arm, and is at the same time in a state of increased abduction or adduction, occurs rarely; and in reference to its ætiology and treatment, all that has been previously said applies.

Lode calls this curvature *Talipomanus extensa*. All the extending muscles of the hand and fingers, as well also sometimes those muscles which flatten the hand, sometimes the adductors, are contracted.

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c.—OF PERMANENT BENDING OF THE FINGER.

Dupuytren, Retraction permanente des Doigts; Leçons Orales de Clinique Chirurgicale, vol. i. pt. i. p. 117.

1395. A *permanent Bending of one or more Fingers* may depend on various causes, namely, on diseased changes of the phalanges, on division of the tendons or palsy of the extensors, on a contracting scar in the palm, on destruction of the tendons and sheaths, or contraction of the bending muscles of the hand, and contraction and unyieldingness of the palmar *fascia*. The *diagnosis* of these various causes is really unattended with any difficulty, and depends on the kind of origin, or the perhaps existing scar, or the possibility of moving some of the finger-joints, or on violently straightening the finger and so on. In this respect the curvature of the finger is most important, as consequent on contraction of the palmar *fascia*, because, with definite *diagnosis*, the cure may be more surely effected.

1396. The curvature consequent on contraction of the palmar *fascia* shows itself especially at the ring-finger, mostly in persons who are subject to hard labour, as resulting from inflammatory affection. After violent exertion of the hand, pain frequently comes on, which, however, soon subsides. The fingers are gradually straightened with difficulty, and the ring-finger begins to curve into the palm, at the onset only the first joint bends, but the others follow its movements. In proportion as the ailment proceeds the ring-finger bends still more. At this period no knotty swelling is yet felt on the palmar surface of the ring-finger; its last two joints are straight and moveable. The first joint is bent at a more or less right angle, it is moveable in its connexion with the *metacarpus*, but the greatest violence cannot straighten it. If the ring-finger be considerably bent, the skin in the palm presents a fold in the direction of the concavity, towards the ring-finger, and the convexity towards the wrist. If the palmar surface of this finger be felt, a stretched cord is found, the point of which is directed towards the first joint, and which may be followed to the upper part of the palm. If the finger be bent, this disappears; but, if its straightening be attempted, the tendon of the

m. palmaris longus is brought into motion, which extends to the upper part of the palmar *fascia*, and the cord is more tightly stretched.

According to Goyraud (*a*) the retraction of the tendinous cords depends on new formations, which pass from the *fascia* to the sheath of the tendon, from it to the lateral parts of the phalanges, and even from one phalanx to another. These bridges are, however, merely growths of the bridges existing in the natural state. Sanson (*b*) also believes that this is the usual cause, and the contraction of the palmar *fascia* only the exception.

If the bending of the finger depend on contraction of the bending muscles, a thick cord is felt, in attempting to straighten it, under the *fascia*; the *m. palmaris* remains immoveable, but the bending muscles on the fore-arm are stretched. In a scar, with the muscles attached to it, stretching movements cause pain in the same part; if the hand be bent towards the fore-arm, then the patient can straighten his finger. In palsy, or in division of the tendons of the straightening muscles, the finger is kept permanently shut into the hand, but it may be straightened with a little force, no tight cord is felt, and all the joints are free. In diseased changes in the joints, the finger is more or less bent; the anchylosed phalanges are immoveable; but the others can be moved, and no tight cord is felt in the palm. Many occupations give rise to deformity of the joints of the phalanges without *anchylosis*, but with permanent bending; thus is the little finger in knitters and seamstresses; so the ring-finger, and often several fingers of the right hand, in tailors; and in lace-makers the four last fingers of both hands are curved and so on, as consequence of habit; no cord-like stretching is, however, noticed in the hand, and the finger may still be somewhat straightened. Scars may be easily distinguished by their tension in attempting to straighten the finger.

1397. That the cause of this crooking of the finger is an excessive tension of the palmar *fascia*, which has arisen from pressure, and bruising in hard handiwork, Dupuytren has proved by careful observation, and by the successful division of this *aponeurosis*. Rubbing, bathing, mechanical apparatus, and the like, have usually no result, or only transient benefit. The latter I noticed in a considerable curvature of the ring-finger from this cause, in which, by continued use of gray mercurial ointment, and animal baths, the proper position and mobility were restored; but shortly after these remedies were given up, the finger again became as strongly crooked as formerly. The division of the palmar *aponeurosis* is most effectual. A transverse cut is made through the skin opposite to the junction of the first phalanx with the metacarpal bone, and then the stretched *aponeurosis* divided in the same direction. If the finger cannot then be straightened, a transverse cut must be made at the joint of the first and second phalanx, or in the middle of the first phalanx. If all the fingers be curved, a transverse cut must be made an inch and a quarter below the former one in the palm of the hand, and the *aponeurosis* divided. The wound is to be covered with lint, and upon the back of the hand a flat piece of wood attached; on the front part, which has divisions corresponding to the fingers, the latter must be kept in the straight position, by means of nooses, till the scars are completely formed. If the palmar *aponeurosis* be narrow and stretched like a cord, it is best to determine on its subcutaneous division (*c*).

Goyraud does not divide the skin transversely as Dupuytren does, because, in straightening the finger, the cut in the skin gapes too much; but he cuts through it longitudinally, and through the bridge transversely.

(*a*) Schmidt's Jahrbücher, 1835. p. 248.
(*b*) Gazette Médicale, 1835. 1. 8 August.
(*c*) B. Cooper; in A. Cooper's Treatise on Dislocations and Fractures. London Edition, 1842. p. 511.

1398. If the cause of the finger crooking be a scar, it must be treated according to rules to be hereafter mentioned. In contraction of the bending muscles, relaxing rubbings must be used on the side of flexion, and irritating rubbing, blisters, and so on, upon the side of extension, and also a corresponding mechanical apparatus. Crooked fingers, from destruction of tendons, or organic changes of the joint-surfaces, and the like, are incurable.

Tenotomy has been variously employed in contraction of the bending tendons and muscles, by which the finger has been perfectly straightened, but the movements of bending were forever lost: the division may be performed on the phalanges or in the palm.

1399. As to the other curvatures, which are seated in the bones themselves, of the extremities, or in their joints, as for example the bending of the fore- against the upper-arm, or of the leg against the thigh, the bowing of the bones of the leg, the inward or outward turning of the knee-joint, and so on, what has been already observed generally, and the circumstances mentioned in the several kinds of curvature, applies to them. Their *treatment* must also be by internal and external remedies, as well as by the construction of suitable apparatus, which must always act by spring-power, and, if these be useless, and the cause be in the shortening of the muscles, if their tendons be accessible, the division of the stretched tendons and *aponeuroses* are easily effected. In such cases, the *m. pectineus* and *sartorius*, the tendons of the *m. biceps femoris*, *semitendinosus*, *semimembranosus* and *gracilis*, the *fascia lata* in the region of the intermuscular *aponeurosis* and the *m. biceps brachii* have been cut through.

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IV.—SOLUTION OF CONTINUITY FROM UNNATURAL EXTENSION.

A—IN THE ARTERIES.

Of Aneurysms.

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(*b*) Doubovitzki, P., Mémoire sur la Section sous-cutanée des Muscles pronateurs-fléchisseurs de la Main et des Doigts. Paris, 1841.

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1400. Every swelling produced by partial expansion of the cavity of an artery, or, after previous division of its coats, by effusion of blood into the surrounding cellular tissue, is called an *Aneurysm* (*Aneurysma*, Lat.: *Pulsadergeschwulst*, Germ.; *Anévrisme*, Fr.) In the former case it is named a true, (*Aneurysma verum*,) and in the latter a *false* or *spurious Aneurysm* (*Aneurysma spurium*.) Some writers have also mentioned a *mixed Aneurysm*, (*Aneurysma mixtum*,) where either after the external arterial coat is divided, the internal expands, or the contrary (*a*). This designation, however, is also used for the case when a true aneurysm bursts, and the blood is effused into the cellular tissue (*b*). The mixed aneurysm, taken in the former sense, does not exist. Breschet (*c*) has, however, by close examination, determined that the middle coat of the artery is torn, and a sac-like expansion produced by the protrusion of the inner coat through the opening in the middle, and by the expansion of the external coat. A combined division and enlargement of an artery and vein is called a *Varicose Aneurysm*, or *Aneurysmal Varix* (*Aneurysma varicosum seu venosum*, or *Varix aneurysmaticus*.) If the expansion affect several branches coming from different trunks, and anastomosing branches and their arches, with or without partial lateral enlargement of their walls, such are distinguished as *Branching Aneurysm*, or *Aneurysm by anastomosis* (*Aneurysma anastomosium seu anastomoticum*, von Walther; *A. spongiosum seu cirsoideum*, Breschet; *Varix arteriosus*, *A. per anastomosin*.)

[The writings of the ancient physicians show their acquaintance with aneurysm, which they described as of two kinds; one, the consequence of a wound in bleeding from the vein in the arm or spurious aneurysm, which would seem to have been of not unfrequent occurrence, as they are best informed about it; and the other by dilatation of the artery without injury, or true aneurysm. I have selected passages from Galen, Ætius, and Paul of Ægina, which are the foundation of the opinions long and subsequently held by writers on this subject.

Galen (*d*) says:—"When an artery is expanded, the disease is called an aneurysm. This happens when, the vessel being wounded, the adjoining skin cicatrizes, but the wound still remains in the artery, which neither unites nor heals, nor is filled up with flesh. Such diseases are known by the pulsation of the arteries, but when pressed, all the swelling disappears, the substance producing it returning into the artery, and which I have elsewhere shown consists of thin and yellow blood mixed with thin and much spirit. Forthwith is this blood hotter than that in the veins, and when the aneurysm is wounded, it darts forth and can with difficulty be stopped. But in *œdema* the substance yields to the pressure of the finger, and the limb pits, but there is no pulsation in this disease, and the colour is whiter, and the *œdema* is much more spread and greater than in aneurysm, except when a *thrombus* having arisen from it, produces gangrene." In another place (*e*) Galen says:—"Aneurysm is the dilatation of a vein, or the dispersion of the spirituous matter by its bursting beneath the flesh."

Ætius (*f*) describes the signs of aneurysm as "a tumour of small or large size,

(*a*) Hunter, William, in Medical Observations and Inquiries, vol. i. p. 338.

(*b*) Monro, A., in Essays and Observations of Edinburgh, vol. ii. p. 238.

(*c*) Mémoire Chirurgicale sur differentes espèces d'Anevrysmes. Paris, 1824. 4to., with six plates.

(*d*) Περι των τετρωσθαι δοκουν βεβλησθαι, chap. xi. vol. vii. p. 725. Kühn's Edition. 8vo.

(*e*) Ορος Ιατρικος, par. ccclxxviii. vol. xix. p. 441. Kühn's Edit.

(*f*) Τετραβιβλος, Discourse xv. chap. 10. I have been obliged to use the Latin Translation by Janus Cornarius, Basileæ, mdxlii.

of one colour, free from pain, soft to the touch, and having a spongy looseness. It yields so to pressure of the fingers as to seem almost to disappear, but on the removal of the fingers it very quickly returns, which is especially observed in aneurysm and the rest that occur without a wound. But when there has been a previous wound of the artery, and the skin uniting, there is also accompanying dilatation of the vessels, the tumour is not equally soft, for the blood being more copious than the spirits, collects in clots and swells out the tumour."

Paul, of Ægina (*a*), proceeds farther, and distinguishes spontaneous aneurysm from that produced by accident. After having quoted Galen's definition and symptoms, he says:—"But I distinguish the one from the other thus: those which arise from a dilated artery are more bulky and deeply situated, and on examination with the fingers a sort of noise is heard; but no noise is heard in those caused by rupture, which are more round and arise superficially. He advises different treatment for the two forms of disease, as will be presently mentioned.

John Hunter defines aneurysm as "the dilatation of the coats of an artery, arising probably either from disease or accident, producing weakness, which becomes the remote cause, while the force of the circulation is the immediate cause. It probably may also arise, however, from a disproportion in the blood's motion, and then the disproportion between the force of the circulation and strength of the artery is both the remote and the immediate cause; but this is probably only in the larger arteries, where the force is greatest." (pp. 543, 44.)]

1401. In true aneurysm the walls of the artery are either expanded only at a small part of their course, (*Aneurysma verum circumscriptum*,) or the expansion affects a larger extent, and is gradually lost (*Aneurysma verum diffusum.*) False aneurysm is also divided into the *circumscribed* or *consequent*, (*Aneurysma spurium circumscriptum seu consecutivum*,) and the *diffused* or *original* (*Aneurysma spurium diffusum seu primitivum.*) In the former case the blood is effused under the cellular tissue of the artery, and outstretches it into the sac; in the latter, all the coats of the artery are divided, and the blood is poured forth into the interspaces of the whole limb (*par.* 278.)

Breschet distinguishes four principal kinds of true aneurysm according to the different form of the expansion of the arterial canal. 1. The *true sac-shaped aneurysm*, in which the artery exhibits at one part of its tube a fulness like a little sac, originating in the expansion of all the coats of the arteries. 2. The *spindle-shaped aneurysm*, in which all the coats of the whole tube of the artery are expanded, but narrow above and below, like a spindle. 3. The *true cylindrical aneurysm*, in which the canal of an artery is, for a greater or less distance, more or less regularly expanded. 4. The *true varicose aneurysm*, or *aneurysmal varix*, in which there is an expansion of the artery, to a greater or less extent of its length, often throughout the entire length of the trunk of the vessel, and of its principal branches, exactly as in varicosity of the veins. Besides this transverse expansion, there is also a lengthening of the vessel, which becomes bent, and describes more or less numerous and considerable curves. There are also sometimes observed, besides this, sudden expansion of the whole arterial cylinder, at certain parts, knots; or little circumscribed aneurysms, which are true sac-shaped and often mixed aneurysms. Very frequently the walls are thinned, softened, and falling together like those of varicose veins, whilst in true cylindrical aneurysm the walls are thickened. The artery affected with *varix* has great resemblance to a varicose vein; the pulsation, however, always presents a distinguishing and determinate character.

1402. The symptoms which characterize aneurysm are the following:—A little elastic pulsating swelling, which diminishes on pressure, and soon returns on its withdrawal, arises at some one spot corresponding to the course of the artery. The pulsation ceases when the artery is compressed between the swelling and the heart, and the former becomes

fol., not being able to put hand on a Greek copy.—J. F. S.

(*a*) Βιβλια εττα, book vi. chap. xxxvii. p. 188. Basileæ, MDXXXVIII. fol.

generally less tense. If the artery be compressed below the swelling, the pulsation becomes more bounding and distinct. The tumour is usually free from pain, the skin over it unchanged, and it quickly enlarges to a considerable size. In proportion as the swelling increases, the blood contained in it becomes more solid by coagulating, and can be no longer got rid of by pressure; the pulsation is weaker, and often entirely lost (1). When the tumour has acquired considerable size, it acts injuriously by its pressure and expansion upon the neighbouring parts; the circulation in the diseased artery, in the other blood and lymphatic vessels, is interfered with; the nerves are compressed; the nourishment, warmth, and sensation of the part are diminished; the limb becomes œdematously swelled; the tumour is covered with varicose vessels, and becomes bluish; and the surrounding muscles, and bones even, may be destroyed by the constant pressure and absorption. In consequence of the expansion of the parts covering the swelling, they at last inflame; at the most prominent part an abscess, or commonly a slough is formed, after the separation of which the coagulated blood is discharged, and a dangerous or fatal bleeding ensues (2). The coverings of the tumour may be also torn by gradual distention. Its size may even become so great, that by the pressure and destruction of the surrounding parts, the nourishment of the limb may be entirely prevented, and its death caused (3).

If the aneurysmal sac increase, it attaches itself to the surrounding parts, which are thickened by inflammation and by the exudation of plastic lymph, and thus enabled, although the coats of the artery be torn, to prevent the penetration of the blood into all the interspaces of the part. If, however, the aneurysmal sac tear suddenly before these adhesions are formed, the blood is poured forth into all the interspaces of the part.

[(1) "The coagulation takes place," observes John Hunter, "at the most distant parts from the direct current of the blood: the firmness and colour of the *laminæ*, in different parts of the tumour, are such that it is easy to distinguish an old *coagulum* from a new one; the external *laminæ* are of a dusty brown colour, and these *laminæ* grow gradually redder as we advance inwards towards the current of the blood. As the dilatation increases, the coats of the artery are thickened by the thickening process, or the cellular membrane already thickened becomes firm, and adheres from a consciousness of weakness. When the aneurism proceeds to this state it generally gives way to the circulation. It must be observed that the force of the blood on the sides of the sac diminishes in an inverse ratio to the increase of its sides, which, therefore, are longer in dilating than might be imagined; but after proceeding to a certain length, the adventitious coat gives way, and the blood is effused into the surrounding cellular membrane, producing distention; and when the artery is a considerable one, there is an obstruction to the blood's motion in the collateral branches, producing mortification. When the artery opens externally, it is always on that side where the artery gives way most." (p. 546.)

(2) The mode in which an aneurysm bursts externally is thus described by John Hunter. "When an aneurism is in an artery whose dilatation brings it to the skin, the *coagulum* comes first, and obstructs the circulation in the skin; the skin inflames and mortifies, forming a black slough, which dries and adheres to the *coagulum*. As the slough separates there is an oozing of blood at the edges, which becomes more and more, till at last in a large artery, as the *aorta*, the plug may be wholly pushed off and the patient die instantly. If in a smaller artery, death will be more gradual." (p. 546.)

Hodgson makes the following good remarks upon the bursting of "aneurisms, which, like abscesses, generally proceed towards the surface of the body; but in this respect they are very much influenced by the situation and the side of the vessel from which the disease originates. When the sac points externally it rarely or never bursts by laceration, but the extreme distention causes the integuments and

investing parts to slough, and upon the separation of the eschar the blood issues from the tumour. A similar process takes place when the disease extends into a cavity which is lined by a mucous membrane, as the œsophagus, intestines, bladder, &c. In such cases the cavity of the aneurism is generally exposed by the separation of a slough which has formed upon its most distended part and not by laceration. But when the sac projects into a cavity lined by a serous membrane, as the *pleura*, the *peritoneum*, the *pericardium*, &c., sloughing of these membranes does not take place, but the parietes of the tumour, having become extremely thin in consequence of distention, at length burst by a crack or fissure, through which the blood is discharged. I have," says he, "examined aneurisms that have burst into the cavities of the *pericardium*, the *pleura*, and the *peritoneum*, and the opening has always been formed by laceration, and not by sloughing: on the other hand, all the instances of this disease that I have seen, in which aneurisms burst upon the surface of the body or into the cavities lined by a mucous membrane, the opening has been the consequence of sloughing and ulceration, and not of laceration." (pp. 85, 6.)]

(3) When aneurysms burst into mucous canals, they do not generally seem to protrude much into their cavity, but the walls of the aneurysm and of the canal becoming adherent, ulceration takes place, and in this way the blood escapes from the sac and often very quickly destroys the patient.

The same thing also happens in that very rare termination of aneurysm by bursting into another artery, an example of which is given by Dr. Wells (*a*), and the preparation is in the Museum at St. Thomas's Hospital. The following is an extract of this interesting case:—

A fair-complexioned, thin, and temperate man, 35 years old, was in 1789 affected with symptoms supposed to denote the approach of pulmonary consumption, but after some time they disappeared. Nine years after he had a slight attack of hemiplegia, from which, however, he soon recovered. In March, 1804, he was frequently troubled with noise in his ears, flatulence, and pains in his hands and feet, from one or other of which he was never after free, but he never complained of any unusual feelings about his chest. On the 11th of August, 1807, having fatigued himself a good deal with walking, and eaten a full dinner, he fell asleep, awoke much refreshed, and played with his children in the garden. "While thus amusing himself, he was suddenly seized between eight and nine in the evening with a sense of great oppression in his chest. He soon after became sick and vomited; in the matter thrown up some streaks of blood were observed. He now went to bed, but though the weather was warm, and he was covered with bed-cloths, his skin felt cold to those who were attending on him. Soon after midnight he laboured under a constant desire to cough, and was continually expectorating mucus tinged with blood. His body was moistened with a cold sweat, his pulse was extremely feeble, sometimes it was scarcely perceptible." He continued getting worse through the night, "his breathing became difficult, and he frequently tossed and writhed his body as if he was suffering great pain and uneasiness. About a quarter past five he suddenly became worse and expired. Almost immediately before his death he complained much of heat in his chest, and threw off the cloths to cool himself." On *examination*, "the blood-vessels of the lungs were found very much distended, and there was also a considerable quantity of blood in the air-cells. The right lung adhered slightly to the ribs and *pericardium*; but this seemed to have been the consequence of some disease which had existed long before death. Each cavity of the chest contained about ten ounces of a fluid highly tinged with blood; the *pericardium* contained about two ounces of a fluid similarly tinged. The ascending *aorta* was distended to about the size of a large orange. The tumour adhered to the pulmonary artery, just before its division, into the right and left branches. Within the circumference of this adhesion there was a narrow hole, by means of which a communication was formed between the two arteries. The cavities of the heart, and the great blood-vessels, were very much distended with blood." (p. 81.) In the Museum at the Royal College of Surgeons, there is one specimen of aneurysm of the arch of the *aorta* burst into the pulmonary artery close to its valves by an oval opening half an inch in its greatest diameter; and also a second, in which there is a small round aperture between the sac and the trunk of the pulmonary artery. The

(*a*) Transactions of a Society for the Improvement of Medical and Chirurgical knowledge, vol. iii.

patient died of jaundice and dropsy; but the aneurysm was not indicated during life.

It may be here mentioned that the pressure of an aneurysmal sac will sometimes produce obstruction in the neighbouring vessels. In St. Thomas's Museum there is an example of complete obstruction of the *superior vena cava*, and *vena innominata*, by an aneurysm of the aortic arch involving also the *arteria innominata*; in the Museum at Fort Pitt, Chatham, is one in which the *superior vena cava* is obliterated; and in the College Museum, one in which the *superior vena cava* is almost obliterated.]

1403. The distinguishing characters of circumscribed true and false aneurysm, are usually described as the following:—True aneurysm quickly diminishes on the application of pressure, though it reappears almost as soon as the pressure is removed: false aneurysm only disappears gradually, and returns slowly after pressure has been taken off, because the blood can only gradually pass from the sac into the artery, and from it again into the sac. A distinct sound is often observed when the blood again flows into the sac (1). The pulsation is weaker in false than in true aneurysm, and sooner becomes indistinct in the enlargement of the swelling. The aperture by which the sac of the false aneurysm is connected with the cavity of the artery, is narrow in comparison with its base; in partial extension of all the arterial coats, the entrance for the blood is just as wide as the base of the sac. When the extension occupies the whole tube of the artery, the swelling is always cylindrical or egg-shaped, yields easily to pressure, and in the dead body is always found smaller than it was during life. The form of the false aneurysm is irregular, and continues the same in the corpse. In the sac of a true aneurysm, layers of coagulated blood are never deposited, which is always the case in false aneurysm, with very rare exceptions (*a*). The more all the coats of the artery are expanded the more they are thinned, whilst, on the contrary, the sac of a false aneurysm increases in thickness (*b*). However, in true cylindrical aneurysm the walls may be equally thick, so that, if cut through vertically to its axis, the walls do not drop (*c*).

[(1) Lawrence (*d*) observes:—"There are some instances in which pulsation cannot be felt, in which it may be heard, either by the application of the ear directly applied to the tumour, or through the medium of the instrument called the stethoscope. The sound that is communicated in either of these cases is very peculiar, the sound produced by the passage of the stream of blood from the opening in the artery leading to the aneurismal sac. The blood passes through comparatively a contracted orifice, to enter into a large cavity, and each jet of the blood propelled into the aneurismal tumour by the contraction of the heart, produces a sound which is something like that of the sound of blowing through bellows—*whih, whih, whih;* you will hear a succession of these; and hence the French, in my opinion, have very appositely characterised it by the term *bruit de soufflet; soufflet* is the term used for bellows: and, in fact, it means 'noise of a bellows;' and, in short, it cannot by any terms be more clearly illustrated." (p. 160.)

I cannot assent to several of the conditions laid down by Chelius, as distinguishing true from false aneurysm. The diminution of the bulk of a true aneurysm depends materially on the stage at which it has arrived; if it be recent and there be little or no lining of clot, it does diminish readily on pressure of the artery between the sac and the heart; but the diminution under these circumstances is less and less, in proportion to the increased bulk of the sac, so that in a large aneurysm there is, comparatively, little diminution of size, though the current of blood be stopped.

(*a*) Hodgson, above cited, p. 82. (*b*) Scarpa.
(*c*) Breschet, above cited. (*d*) Lect. on Surg.; in Lancet, 1829–30, vol. ii.

False aneurysm diminishes still less, and often, indeed when the blood continues, as it commonly does, pouring into the cellular tissue it there coagulates, scarcely any perceptible diminution of size is made by pressure on the artery between it and the heart. And a true aneurysm which has burst a sac beneath the skin, as sometimes happens, is similarly circumstanced. The pulsation is generally less distinct in a false than in a true aneurysm; but this also depends on the period and extent occupied by the blood which has escaped, and is proportionally less, the greater the quantity of blood poured out. The external form of a false aneurysm is undoubtedly irregular, as it much depends upon the looseness of the surrounding cellular tissue, and whether the part be or be not enveloped in a tendinous sheath; but the immediate sac, consisting only of more or less numerous layers of coagulated blood, which as they continue to form, thrust the loaded cellular tissue away from the artery, and hollow it out for their own lodgment, is generally of a regular oval form, and has at one or other part an aperture, by which blood continues escaping and gorging the cellular tissue surrounding the false sac, till at last it distends the skin so much that it mortifies and gives way at one or more points, and bloody serum and clots mixed with ill-formed pus, which is commonly produced towards the termination of the disease, begin to be discharged, and increase in quantity till the false sac itself break away and the blood readily make its way out. I cannot understand the observation, that "in the sac of a true aneurysm layers of coagulated blood are never deposited," which is most undoubtedly, incorrect in all cases where the aneurysm results from ulceration or tearing of one or other coats of the artery; for very speedily after a pouch is formed, layers of clot begin to form. And even when the disease only depends on dilatation of the arterial coats, though at first there be no layers of clot, yet as the disease proceeds, they are certainly formed, although Hodgson denies it and says:—"In those sacs which consist either in a general or partial dilatation of the coats of the vessel, I have never met with it." (p. 82.) As to the difference of thickness of sac in true and false aneurysm, although in the former the coats of the artery thin as the disease increases, yet there is a continued slow inflammatory action going on upon the external surface of the sac by which its thickness is preserved, till the parts by which it is surrounded having been either absorbed or stretched to bursting by its size, the sac itself is the only remaining resistant to the impulse of the blood, and in its turn yields, thins, and at last it bursts. As to the thickening of a false aneurysmal sac, it continues indeed so long as the surrounding cellular tissue confines and supports it, but when the tissue is absorbed or sloughs, the want of support is here also felt, and the false sac thins, yields, and bursts as in true aneurysm.—J. F. S.]

1804. The distinction of aneurysm from other swellings is grounded on the pulsation, the diminution by pressure, the reappearance when the pressure is removed, and the position corresponding to that of the course of an artery. When therefore the pulsation is indistinct, or not at all perceptible, and the swelling cannot be diminished by pressure, it must be the more carefully examined, and attention paid to its origin and its early condition. Swellings in the neighbourhood of a large artery, or lying upon it, participate in the pulsation, which, however, to a practised touch is easily distinguishable, as it consists only in a raising and sinking of the swelling; but if such swelling contain any fluid which undulates by the imparted motion, the *diagnosis* is doubtful: a degree of certainty, however, may be attained, if the artery be compressed above the swelling, and the latter be then properly examined (*a*).

[Aneurysms are sometimes mistaken for abscesses. Dupuytren witnessed a case in which the blood issuing from an aneurysm of the arch of the *aorta*, made its way behind the breast-bone into the bottom of the neck, and there formed a tumour, which, being mistaken for an abscess, was punctured, and gave rise to repeated, and at last fatal bleedings. Richerand (*b*) says, that "Ferrand, principal Surgeon at

(*a*) Ribes, Mémoirs et Observations d'Anatomie, de Physiologie, de Pathologie, et de Chirurgie, Paris, 1841. vol. i. p. 255.

(*b*) Nosographie Chirurgicale, vol. iv. Fourth Edit. Paris, 1815.

the Hôtel-Dieu, thinking to open an abscess in the arm-pit, plunged his knife into an axillary aneurysm, and killed his patient." (p. 72.) Astley Cooper mentions an instance of an aneurysm which had presented in the loin, being punctured, under supposition of it being a lumbar abscess; the mistake, however, being ascertained, the edges of the wound were immediately brought together and healed, and the patient died by the tumour afterwards bursting internally. (p. 35.) I myself recollect a spurious aneurysm, after venesection, having been punctured as an abscess; the bleeding was stopped immediately, but about twenty hours after, as the girl was dressing her hair, the bandage slipped off, a violent gush of arterial blood followed, and she lay in great jeopardy for many hours before she was in a fit state to have the artery secured.

On the other hand, a pulsating tumour may be mistaken for an aneurysm, an example of which is mentioned by Warner (*a*), in a boy who had his breast-bone much fractured by a fall, and came to Guy's Hospital a fortnight after. "There was an evident separation of the broken parts of the bone, which were removed at some distance from each other. The intermediate space was occupied by a tumour of considerable size; the integuments were of their natural complexion; the swelling had as regular a contraction and dilatation as the heart itself, or the aorta could be supposed to have. Upon pressure, the tumour receded; upon a removal of the pressure the tumour immediately resumed its former size. * * * The event was, the tumour burst in about three weeks from his admission, discharged a considerable quantity of matter, and the patient did well by very superficial application." (p. 155.)

Sometimes a large *varix* of the accompanying vein may turn so completely over the artery as to hide it completely, and receive its pulsation. In St. Thomas's Museum there is a very fine example of this disease in the internal jugular vein, the swelling of which, from its size, must have occupied nearly the whole of the one side of the neck. Such cases may be distinguished by pressure of the swelling at its farthest extremity from the heart, in which case its size will diminish, whilst if pressure be made between it and the heart, its bulk must be increased which is the very reverse to aneurysm.

Tumours of any kind upon an artery will often acquire pulsation from it, and be liable to mistake; their unvarying size, however, and commonly the cessation of the pulsation when the swelling is lifted up, will generally determine their true character.—J. F. S.]

1405. Aneurysms arise either of their own accord, or after determinate external influence (*A. spontaneum* and *traumaticum*.) In the former case they occur generally at more than one spot, either at once or consecutively, and thus show that a peculiar morbid condition spreads more or less over the arterial system. This is observed most commonly in persons who are subject to rheumatism, gout, *scrofula*, *syphilis*, who have used much mercury, and have drank spirits to excess. In these cases there frequently arise inflammation of the internal coat of the artery, ulceration, loosening, thickening, even ossification between the internal and middle coats, by which the walls of the artery yield to the pressure of the blood, or the internal and middle coats are torn or destroyed. The external influences which produce aneurysm are wounds, violent efforts in lifting heavy weights, in jumping, in vomiting, coughing, and the like. These circumstances (wounds naturally excepted) produce aneurysm the more readily, if the coats of the artery have been changed by disease, as above mentioned.

[Richerand mentions a curious circumstance in reference to "a class of persons who almost always die of aneurysm, and whom he noticed whilst engaged with anatomy. These were the servants of the amphitheatre, whose business it was to bring the subjects and remove the refuse of the dissections. I never saw one," says he, "who did not abuse spirituous liquors, and was not constantly drunk;

(*a*) Cases in Surgery. London, 1784.

and to this were added the feebleness resulting from such excesss, the fatigues of so disgusting and laborious an occupation which occupied their nights, the exertions required to carry bodies often too heavy for a single person, wearied with sleep and drunkenness." (p. 71.)

Guthrie also observes:—"The exertion in general is infinitely greater in the man than in the woman; and I think this, combined with the freer use of ardent spirits, a much more likely predisposing cause than either *syphilis* or mercury." (p. 87.)

With regard to the age at which aneurysm occurs, Astley Cooper observes:—"The period of life at which they most frequently occur is between thirty and fifty years; at that age in the labouring classes the exertions of the body are considerable and its strength often becomes diminished: in very old age this complaint is less frequent, as muscular exertion is less. The greatest age at which I have seen aneurism has been eighty years; this was in a man for whom I tied the popliteal artery in Guy's Hospital, for popliteal aneurism; and, notwithstanding his advanced age, I never had an operation succeed better. I also operated on a man of sixty-nine years, and that case also did well. A boy, in St. Thomas's Hospital, had an aneurism of the anterior tibial artery, who, I was informed, was only eleven years old. The man of eighty was the oldest, and the boy of eleven the youngest, which I have seen with aneurism." (pp. 40, 1.)

As regards the frequency of aneurysm in the sexes, Wilson (*a*) remarks, that shortly before John Hunter's death, he heard him state that he had only met with one woman with true or spontaneous aneurysm. Astley Cooper says:—"In forty years' experience, taking the hospital and private practice, I have seen only eight cases of popliteal aneurism in the female, but an immense number in the male. The aneurisms which I have seen in the female, have been the greater number in the ascending *aorta* or the carotid arteries." (p. 41.) Of the sixty-three cases referred to by Hodgson, seven only were females, and the other fifty-six males. (p. 87.) Guthrie states, that he "does not recollect having seen more than three women suffering from popliteal aneurism; and it is probable that they are found, on an average, at least, from twenty to thirty times in men, for once in woman. The structure of the vessels is the same, but the mode of life is different." (p. 87.) Lisfranc (*b*) mentions that of one hundred and fifty-four cases which he had collated, one hundred and forty-one were males, and thirteen females. I myself, in the course of thirty years, do not recollect more than three external aneurysms, which were popliteal, in females.—J. F. S.]

1406. Aneurysm may occur in all arteries: the internal arteries are, however, more frequently attacked with it than the external, the reason of which may be, that the nearer the arteries are to the heart, the thinner are their walls in proportion to their diameter, consequently they are less capable of withstanding a violent pressure of the blood. The curves, also, which the arteries describe in their course, have an influence on the more frequent origin of aneurysm. Aneurysm of the arch of the aorta is most frequent; next comes aneurysm of the popliteal, then of the inguinal, axillary, and carotid arteries. False aneurysm, as a consequence of the wound of an artery, occurs most commonly in the brachial, after an unlucky blood-letting.

[The force of the heart, however," says John Hunter, "has some power in operating as a remote or first cause of aneurisms. Aneurisms are most frequent in the larger arteries, as at the arch of the *aorta*, and more frequent in the second order of arteries than in the third; but they are sometimes found even in the fourth and fifth. * * * The nature of the artery contributes likewise, the structure of the large arteries being chiefly of elastic matter, and not near so muscular as the small ones, which have therefore greater powers of resistance." (pp. 544, 45.)]

(*a*) Lectures on the Blood, and the Anatomy, Physiology, and Pathology of the Vascular System. London, 1819. 8vo.

(*b*) Des diverses Méthodes et des différens Procédés pour l'Oblitération des Artères dans le traitement des Anévrysmes. Paris, 1824. 8vo.

Of the comparative frequency of aneurysm in the different external arteries, the following tables are given by Hodgson and by Lisfranc:—

Hodgson.

Popliteal and Femoral	14 males.
Ditto	1 female.
Carotid	2 males.
Subclavian & axillary	5 "
Inguinal	12 "
Total	34

Lisfranc.

Popliteal	59	Brought forward	165
Femoral, at the groin	26	Anterior tibial	3
" other parts	18	Gluteal	2
Carotid	17	Internal iliac	2
Subclavian	16	Temporal	2
Axillary	14	Internal carotid	1
External iliac	5	Ulnar	1
Brachio-cephalic	4	Radial	1
Brachial	3	Palmar arch	1
Common iliac	3	Peroneal	1
Carried forward	165	Total	179

Not unfrequently there is more than one aneurysm existing at the same time; it, therefore, becomes a matter of high importance to make a careful examination of the whole of a patient's body upon whom it is proposed to operate; for if there be any internal aneurysm, it is useless to subject him to an operation from which he can derive no real benefit, as the internal aneurysm will sooner or later destroy him. Astley Cooper mentions that "the elder Cline was about to operate upon a man in St. Thomas's Hospital, who had a popliteal aneurysm, but deferred it on account of the patient's complaining of a pain in his *abdomen*. A few days afterwards the man died suddenly, and, on examination, an aneurysm was found between the two emulgent arteries, which had burst into the abdomen." (p. 30.) Or the excitement of an operation may cause the bursting of an internal aneurysm, which happened with a patient upon whom Astley Cooper had commenced operating for popliteal aneurysm. "The patient stretched himself on his back, and his urine flowed from him; * * * he gave a deep gasp, and in a few minutes was dead. The next day," says Cooper, "I opened the body, and found the *pericardium* distended with blood, which had escaped from an opening seated at the beginning of the *aorta*, immediately above the semilunar valves." (p. 29.) The preparation is in the Museum at St. Thomas's Hospital.

Sometimes many aneurysms are met with in the same person. Astley Cooper tied the external iliac artery for an aneurysm at the origin of the *profunda*, and another in the middle of the thigh; the man died afterwards of aneurysm at the bifurcation of the *aorta*, which burst into the belly. "Upon examination, an aneurysm was found in each ham; one at the bifurcation of the *aorta*, one at the origin of the *arteria profunda*, one in the middle of the thigh, and two between the popliteal aneurysm and the femoral, making in all seven aneurysms." Tyrrell, in a note upon this case, mentions another instance in which he operated on a man who was afterwards found to have seven aneurysms." The operation was performed for a popliteal aneurysm in the left ham. "Whilst feeling in the course of the artery, before commencing the operation, I found," says Tyrrell, "a small aneurysm near the part in which I had intended to secure the vessel; this led to a more minute examination of the patient, and at that period another aneurysm was found just above the tendon of the *triceps*, on the same side, making two femoral aneurysms and a popliteal on the left side. On the right side the artery felt dilated in several places, but a little below Poupart's ligament an aneurysm existed as large as an egg. After farther consultation, it was decided that I should tie the femoral artery between the two small aneurysms, as we feared that a ligature in the external iliac would not command the hæmorrhage from the aneurysmal sac," (which had been punctured to ascertain its character, previously very doubtful.) The space between the two aneurysms in the femoral was about an inch, or an inch and a half, appeared sound, and a ligature was applied on it. During the following three weeks the limb became gangrenous, and the aneurysmal sac in the ham sloughed, exposing the thigh-bone, but amputation was not performed, for fear of the diseased condition of the artery. "The ligature did not separate from the wound until the sixth week, and the patient lingered till the 28th of July," (eight weeks and a-half after the operation.) "The popliteal and inferior femoral aneurysms of the left side had been destroyed by the sloughing; that above the ligature was not closed. On the right side were found three femoral aneurysms, and a small popliteal, making in all seven; besides some dilatation of the *aorta*, immediately above the bifurcation." (pp. 38, 9.)

Still more remarkable is the case mentioned by PELLETAN (*a*), who observes:—"I have often seen numerous aneurysms affecting indifferently the large and small arteries, but specially those of size; I counted 63 in one man, from the size of a filbert to that of half a pullet's egg," (p. 1.) And in another case, related by CLOQUET (*b*) "all the arteries were studded with aneurysmal tumours from the size of a hempseed to that of a large pea. Some were on the *aorta* and its principal divisions, but they projected little and were much less numerous than on the arteries of the limbs," which, "on many parts of their length, formed kinds of necklaces; all the swellings were numerous and close together. Those of the lower limbs were perhaps less numerous; without exaggeration they might be estimated at several hundreds. The arterial walls seemed unaltered in structure, except at the swellings, where the tunics were dilated and thinned. In none did I observe rupture of the inner or middle coats." (p. 86.)]

1407. The old opinion that spontaneous aneurysm almost always depends on an expansion of all the arterial coats, has been disputed by many writers, but most efficiently by SCARPA, and the *origin of aneurysm placed in a tearing of the internal coat of the artery, effusion of blood through this tear, and expansion of the cellular sheath of the artery.* The correctness of this opinion is grounded on the condition of the arterial coats in their natural state, and on the careful examination of aneurysmal arteries. For the internal and middle coats of arteries cannot, on account of their slight degree of elasticity, permit any great degree of extension without tearing; whilst, on the contrary, their external or cellular coat is in the highest degree extensible. Examination shows that in all large aneurysms their proper sac communicates with the cavity of the artery by a large or small opening, frequently, as it were, fringed, and often hard and callous; that, therefore, the swelling never includes the whole tube of the artery, as would be the case in expansion of all the arterial coats, but is connected with the artery like an appendage fixed on a stem. Farther, that in the wall of the artery, opposite the torn part, the several coats are found in their natural condition, and can be decidedly distinguished from each other; that in spontaneous aneurysm the internal coats are usually changed in a manner (*par.* 1405) which, indeed, favours their tearing, but not their extension. Also, in expansion of all the coats of the artery, no collection of coagulated blood can take place, as the blood always remains within the cavity of the vessel. The reason, however, why it is so easily assumed that the sac of the aneurysm is formed of all the coats of the artery, is founded on the cellular tissue being always considerably thickened, and at the commencement of the tear being adherent, in the closest manner, to the internal coats of the artery, which are here always more or less disorganized, often quite brittle. Besides, also, every remark usually applied to aneurysm by expansion, is equally applicable to aneurysm by tearing. Only in the *aorta*, near to the heart, does SCARPA admit the possibility of simultaneous expansion of all the arterial coats; however, even here it can only attain a certain degree, without tearing of the internal coat.

[JOHN HUNTER somewhat inclines to a diseased condition of the artery; for he says:—"It would appear that there must be a specific disease of the artery in most cases, for dilatation is too local for so general a cause as the force of the heart." (p. 545.)]

1408. Close and careful, however, as are the observations of SCARPA, and valid as is his opinion against the often too ready assumption of an

(*a*) Clinique Chirurgicale, vol. ii. (*b*) Pathologie Chirurgicale. Paris, 1831. 4to.

extension of all the arterial coats in aneurysm, their truth cannot, however, be admitted in every case. Examinations instituted by the closest observers, show that the arteries are subject to an expansion, not only of their whole tube, but also of particular parts (*a*). Scarpa himself admits the possibility of extension of all the coats in the arch of the *aorta*. In old persons, especially females, the expansion of the arch of the *aorta* without degeneration or tearing, is twice as frequent. Even the trunk of that vessel has been found throughout regularly expanded to nearly double its size (*b*). Enormous expansion of the *aorta* and pulmonary arteries, are a common appearance in diving animals.

On examining an aneurysm in which the internal coat has been torn, and a considerable sac formed in the cellular coat, the area of the artery is often found considerably enlarged, at the place where the tear has occurred, and no other change in the inner and middle coats of the artery, than that they are expanded and thinned. The enlargement of the neighbouring branches of the arteries, if the circulation be in any way checked in the principal trunk, and the frequently considerable expansion of the capillary vessels in the branching aneurysm, presently to be considered, contradict Scarpa's opinion. From these reasons, however, it only follows, that a simultaneous expansion of all the arterial coats is possible, but that when it attains a certain degree, tearing of the internal and middle coats occurs; consequently, a *false aneurysm* is produced from a *true aneurysm*.

1409. Although the above-mentioned (*par.* 1372) results are the common terminations of aneurysm, and the disease, if left to itself, nearly always ends fatally, yet, however, it is capable of a spontaneous cure, which may be brought about in different ways.

1. If the aneurysmal sac attain considerable size, it may compress and obliterate the artery. This is the more rare case (1).

2. A severe inflammation which attacks the whole aneurysmal sac, and runs into suppuration or gangrene, may act so violently upon the artery itself, that its adhesion may be produced, and no bleeding occur after the bursting of the sac; but the suppurating part closes without any trace of aneurysm.

3. A deposit of clot in layers may take place in the sac, by which its cavity may be diminished, and at last even filled up. The clot extends into the canal of the artery, and closes it to the next collateral branch, above or below the swelling (2). This kind of spontaneous cure of aneurysm is announced by the swelling becoming solid, and by a weaker or completely stopped pulsation (*c*).

4. The clot contained in the sac may be converted into a solid, fleshy, steatomatous mass, by which the bursting of the sac is prevented; in which case, however, the area of the artery is preserved, and the sac gradually diminished by absorption (*d*).

In simultaneous extension of all the coats of an artery, spontaneous cure is impossible, because it never arrives at the deposition of a clot (*e*).

[(1) The obliteration of an artery by the lengthening of an aneurysm into a pouch-

(*a*) Hodgson, above cited, p. 74. Breschet, above cited.

(*b*) Meckel, Handbuch de pathologischen Anatomie, vol. ii. pt. i. p. 244.

(*c*) Hodgson, above cited, p. 114.

(*d*) Ib., p. 118.

(*e*) Scarpa.

like form, at that side of the sac most distant from the heart, is well explained by JOHN HUNTER. He says:—"Even in the last-mentioned situation, (the leg,) the force of the heart directs, in some degree, the swell of the tumour; but that is not until the sac is a good deal enlarged. The force of the blood against the most distant part of the sac endeavours to carry it on farther in the direction of the motion of the blood, which in time makes a pouch; therefore it is elongated in the direction of the sound artery. The sac often, by its increase, presses on the sound part of the artery, and becomes the cause of its obliteration, as I have seen more than once." (pp. 544, 45.) Of this kind of spontaneous cure there is a magnificent specimen in the Museum at St. Thomas's, in an aneursym of the femoral artery, just below the *profunda*, which has formed a large long sac that has descended for several inches below its communicating opening, and has completely compressed the artery, which is full of clot even into the ham.

(2) There is in St. Thomas's Museum a very excellent example of a popliteal aneurysm, in course of cure by this proceeding; the clot in the aneurysmal sac is very close and solid, and through its centre is a track, less in diameter than the natural tube of the vessel, by which the blood has been conveyed to the leg, but which has been evidently fast diminishing. FORD's cases, presently to be noticed, appear to have been cured in this way. In the Museum of the College of Surgeons there is a globular axillary aneurysm, about an inch in diameter, filled with laminated clots, and the artery beyond it contracted.—J. F. S.]

1410. What has been said about the spontaneous cure of false aneurysm applies also to artificial assistance. For in general the cure of an aneurysm is only possible, in so far as a closing of the artery can be produced, or such a collection of the clot in the sac, as may withstand the pressure of the blood, and gradually contracts; the artery, however, remaining pervious.

1411. After the obliteration of the trunk of the vessel the circulation is carried on in the limb, by the collateral branches, which enlarge considerably, and are connected with each other by numberless anastomoses. In many cases a more direct and manifest anastomosis of the vessels take place, so that after the closure of the principal trunk, the stream of blood at once passes by the neighbouring branches; in other cases, the collateral circulation is only undertaken by small numberless anastomoses (*a*.) Upon the different ways in which the collateral circulation is produced, and partly also on the point of time when the vessel is examined, after the obliteration of the principal trunk, may depend *whether the collateral branches appear more or less, or even not at all, enlarged.* The frequent examinations, in which, after the obliteration of the principal trunk of an artery, the other arteries of the limb are found considerably enlarged, do not therefore contradict the equally true observations, in which this enlargement is not found (*b*).

1412. The remedies which have been proposed, generally, for the treatment of aneurysm, are, *rest and antiphlogistic treatment, the application of cold and contracting remedies to the swelling, the compression, and tying* of the aneurysmatic artery.

1413. Strict rest, lowering treatment, restricted diet, repeated bloodletting, even to the greatest degree of weakening, (VALSALVA's plan,) and the internal use of *digitalis*, are the only modes of treatment by which the cure of internal aneurysm may perhaps be effected; in which indeed, under great diminution of the circulating power, the blood coa-

(*a*) HODGSON, above cited, p. 235.

(*b*) FRESSLING, Dissert. de sistendis hæ- Heilardes Kropfes, u. s. w. Sulzbach, 1817.
morrhagiis. Groen., 1804. WALTHER, Neue p. 65.

gulates in the sac, and the aperture, whereby the sac communicates with the artery, is closed. In certain cases the area of the artery may be at the same time preserved, (*par.* 1409,) but in others the coagulation of the blood extends into the artery, and shuts it up. In true aneurism, a diminution and contraction of the walls of the artery may thus be effected.

1414. The *astringent remedies* employed for the purpose of restoring their elasticity to the arterial coats, or for effecting the complete coagulation of the blood in the sac, are, applications of cold water, pounded ice (1), bark, oak bark, and so on. If this mode of treatment, which was formerly employed, have in many cases a satisfactory result, it may be in part ascribed to the compression generally at the same time employed with it, and more especially to keeping the patient at rest. Perhaps, however, all share in the business must not be denied to these topical applications, as they are capable of favouring the coagulation of blood in the sac, and in this way promoting the cure (*a*).

[(Guérin, of Bordeaux, appears to have first proposed the application of pounded ice, or iced water, to the aneurysmal sac (*b*); and though its beneficial use was much doubted, yet Richerand says, that "subsequent observations have proved the advantage of pounded ice in the treatment of aneurysm. The examinations of the bodies of persons cured in this way, have dissipated all doubts as to the value of this remedy, and he mentions a case reported in the *Bulletin de la Faculté de Médecine de Paris*, No. 4, 1812, in which a popliteal aneurysm was thus cured. The patient lived a considerable time after the disappearance of the tumour, and the preparation is now in the Museum of the School of Medicine. On the contrary, Hodgson says:—"I have seen ice applied to a large inguinal aneurism, but it produced such excruciating pain that its employment was from necessity discontinued." (p. 163.)]

1415. *Compression* and *Ligature* of the aneurysmatic arteries are the two modes of treatment which especially apply to the cure of external aneurysms. They agree with each other in effecting the obliteration of the artery; this takes place slowly by compression, in which case the circulation is gradually restored by the collateral branches, but occurs quickly on tying the artery. Only in a spurious aneurysm, which arises from a wound in an artery, and has not long existed, can a cure by compression be effected, without subsequent closure of the artery, as has been already granted in wounds of arteries, under certain circumstances (*par.* 279).

1416. Compression has been employed *upon the aneurysmal swelling, above it, and as a swathing of the whole limb.* Proper apparatus or bandages have been used for the purpose.

1417. *Compression of the swelling alone*, is on many grounds objectionable. It is difficult or impossible, on account of the depth of the artery, and the different size of the swelling, always to employ the compression properly, and in the same direction; the aneurysmal sac may be developed in another direction, and if the compression be made sufficiently great, severe pain, inflammation, and bursting of the sac, may be caused. Nor is it certain whether the pressure operates upon that part of the artery above the opening, by which the sac communicates

(*a*) Radeloose, H., Dissert. sur l'emploi des réfrigérans dans les Anévrismes externes. Paris, 1810.

(*b*) Recueil Périodique de la Societé de Santé, à Paris, No. 3.

with the artery, or upon the part below this opening, in which latter case the speedy bursting of the artery may be produced.

1418. Compression of the artery is to be made at that part above the aneurysmal swelling, where the artery is superficial and the surrounding parts afford a proper point of support for the compression; in doing this, however, care must be taken to avoid the collateral vessels above the swelling, especially the larger ones. All the contrivances by which this compression is effected, must be so managed that they compress the limb only on two sides, because otherwise they would check the circulation too much (*par.* 285.) The compression must be gradually increased, with the greatest care, and so long continued till the obliteration of the artery is effected. This compression is often unbearable, when, for example, the artery is accompanied by the principal vein of the limb, or by considerable nerves. The femoral artery in its upper third, and the brachial artery, throughout its whole length, bear compression best. The position of the median nerve, however, close to the brachial artery, renders this less fitting, and the compression is painful. It is therefore especially applicable only to the femoral artery (*a*).

Here also may be mentioned alternate compression with several tourniquets at different parts.

Hutton and Cusack (*b*) have communicated cases of successful result from compression of the femoral artery in aneurysm of the popliteal artery, in which the compression was employed only for some hours, and repeated every day or at longer intervals.

1419. The *compression of the whole limb*, by proper bandaging, in which, by the application of graduated compresses along the course of the artery, increased pressure is made, is not usually accompanied with inconvenience to the patient; the œdematous swelling disappears, and the cure may be effected by this simple remedy. The event of the cure in these cases appears always to be the complete coagulation of the blood in the aneurysmal sac, depending on the arrest of the circulation throughout the whole limb.

[The unsatisfactory results of the treatment of aneurysm by tying the affected artery above and below the sac, opening and emptying the latter, either before or after the ligature, and then inducing it to fill up by granulation, as also the dangers of amputation, led Guattani (*c*) to consider the possibility of some other proceeding for the management of "a disease, so evidently incurable, that both medicine and surgery renounced all kind of treatment." He had, however, observed several cases spontaneously cured, in patients who would not submit to either of these operations, and he hoped to succeed by a somewhat similar process. "Many indeed," says he, "were the trials and dangers depending on the varieties of aneurysm, some of which differed from others in their nature; nor did all arise from one and the same spot. But when I especially inquired into those aneurysms which occurred at joints, I was led to suspect that by rest in bed and weakening the whole body, at the same time also restraining the flow of blood in the artery running to the affected part, and finally by gradually compressing the aneurysmal tumour itself by the aid of bandages, I might be able not only to prevent its increase, but that in course of time the grumous blood would, by little and little, of itself be changed into serum, and rendered fit for circulation, and that the entire resolution of the tumour would at length take place. A methodical bandaging, which should from day to day more and more compress the affected part, seemed to me the only means which could fulfil all the

(*a*) Guillier Latouche, C. H., Nouvelle manière d'exercer la Compression médiate prolongée sur les principales Artères des Membres Strasbourg, 1825. 4to.

(*b*) Dublin Journal of Medical Science, vol. xxiii., 1843, p. 364.

(*c*) Quoted at head of Article in Lauth's Collectio.

indications; but as in doing this many hindrances occurred to me which seemed adverse to a happy result, I continued in doubt, whether I should entirely give it up, or whether at some future time I should be induced to practise it." (p. 129.) In this frame of mind he continued till 1757, when a case of aneurysm of the upper part of the femoral artery having occurred, he employed simple bandaging, which to a certain degree controlled the growth of the swelling. But the patient would not submit to the necessary rest, and left GUATTANI for another surgeon, who tied the artery, and, probably opening the sac at the same time, bound it up very tightly, and the man died of mortification of the limb on the third or fourth day. As this could not be considered a satisfactory trial of his plan, he determined on trying it in another case, a spurious aneurysm, as he calls it, of the popliteal artery, and of which he commenced the treatment in November, 1765, according to the following manner:— "Having for some days previously," says he, "applied lint dipped in vinegar and water, I covered the whole mass of the tumour with lint, and then applied two oblong pillows across each other, like the letter X, upon the centre of the swelling, in such a way that the upper ends of both embraced the knee above and the lower below; another oblong pillow, wetted with vinegar and water, was then applied along the whole length of the femoral artery to the groin, and moistened all the lint surrounding the knee and covering the whole extent of the thigh. I then employed a strong long bandage, three inches wide and no more, and having made the first turn upon the centre of the swelling carried it around both above and below, in the usual way of bandaging the joint, and wound it round sufficiently to cover and compress it equally. In the same way I bound the whole length of the thigh up to the groin, and in order to render it more secure, made a couple of turns round the trunk, and so completed the bandaging. I took special care that the first turn of the roller should not too much constringe the part, and was very cautious that the pressure should be equally kept up, so that every turn of the bandage covered the preceding one rather more than half its breadth; which indeed, in every surgical operation where this indication presents, should always be done." (p. 131.) Blood letting, low diet, complete rest of the joint, and the application of spirits of wine, were ordered. "I left the bandage undisturbed," he continues, "as long as it performed its duty. If properly applied, it would remain for eighteen or twenty days. * * * In re-applying I always took care it should be put on somewhat tighter. I also directed moderate blood letting, especially when either the leg or foot swelled in the least, which prevented the renewal of the bandage if by chance it became tighter than the patient could bear. Subsequently the lint and pillows were moistened with vinegar and water, that I might prevent too much heat of skin, which coming on might have delayed not a little the cure. By patient and assiduous use of this treatment I was delighted to find that the swelling, although it constantly preserved its hardness and pulsation, daily decreased more and more; so that, indeed, after three months, I had the great pleasure of seeing the patient leave the hospital perfectly cured. Nothing remained of it at the place of the torn artery but a callosity, scarcely the size of a large bean." (p. 132.) Such was the treatment GUATTANI adopted and continued to practise with success, and upon it has been founded the practice of others at a subsequent period.

JOHN HUNTER tried compression in one of his cases, but the patient could not bear it, and he was obliged to tie the artery.

In the beginning of 1802, BLIZARD (afterwards Sir WILLIAM) attempted compression of the femoral artery in a case of popliteal aneurysm, with the hope of effecting obliteration, in the following manner: (*a*)—"The points of support for the instrument were the outer part of the knee and the great *trochanter*, a piece of steel passing from the one to the other: and to the middle of this a semi-circular piece of iron was fixed, which projected over the femoral artery, having a pad at its end moved by a screw, by turning which, the artery was readily compressed, and the pulsation in the aneurysm stopped, without any interruption to the circulation in the smaller vessels. But although the patient possessed unusual fortitude of mind, and indifference to pain, he was incapable of supporting the pressure of the instrument longer than nine hours; and when it was loosened, the pulsation in the tumour returned with unabated force. After a fair trial of this plan the man quitted the London

(*a*) From a paper of ASTLEY COOPER'S on Aneurism, in Med. and Phys. Journ., vol. viii. p. 2, 1802.

Hospital; and his femoral artery was tied by Astley Cooper in the following April, in the then usual way, with two ligatures and division of the artery between. He did well.

In 1807, Freer, of Birmingham (*a*), having witnessed two cases in which Guattani's treatment had been adopted, "does not hesitate to recommend the cure of aneurism to be attempted, in the first instance, by pressure, rather than by an operation, which frequently occasions death, even when the patient might have recovered, if left to nature alone." Compression may be applied either on the aneurismal tumour itself, or upon the sound artery above it. In those cases, where pressure has been hitherto applied, it has been upon the tumour itself; and though this mode of application has frequently been attended with success, it is by no means so likely to answer the intention of uniting the sides of the vessels, as when used on the sound part of the artery. From the result of those experiments I made upon the radial artery of a horse, I should recommend the pressure to be applied on the extremities, either by the assistance of Senffio's instrument, or in the following manner:—First, place a bandage moderately tight from one extremity of the limb to the other, then place a pad upon the artery a few inches above the tumour, that you may have a greater probability of its being in a sound state; then, with a common tourniquet surrounding the limb, let the screw be fixed upon the pad, having previously secured the whole limb from the action of the instrument, by a piece of board wider than the limb itself, by which means the artery only will be compressed when the screw is tightened; the tourniquet should then be twisted till the pulsation in the tumour ceases. In a few hours, as by experiment in the horse, the limb will become œdematous and swelled; the tourniquet may then be removed, and no stronger pressure will be required than can easily be made with the pad and roller. The irritation produced by this mode of pressure, excites that degree of inflammation of the artery which deposits coagulable lymph in the coats of the vessel, thickens them, diminishes the cavity and eventually obstructs the passage of the blood." (p. 112, 113.) Hodgson mentions two cases in which this mode of treatment was adopted: in the one, a popliteal aneurysm, the pressure could not be supported longer than two hours, and in the other, where "it was applied to the brachial artery, the pain and swelling of the limb was so considerable that the surgeon was compelled to abandon the practice." (p. 177.)

Richerand (*b*) observes, that if "the compression be made above the aneurysm, the compressed artery must be superficial, and have a solid *point d'appui* in a neighbouring bone. The compression also must not operate on the whole circumference of the limb; if spread over too large a surface, it will be too weak to press down the walls of the vessel; it will uselessly cause severe pains, produce swelling of the limb, by opposing the return of the lymph and venous blood; and it will hinder the passage of the blood through the collateral vessels, and consequently tend to produce want of nourishment, and gangrene of the limb, by obliterating all its vessels, on which account circular compression is to be entirely discarded in cases of aneurysm. * * * A tourniquet, or any analogous instrument, should be used, which will make a strong pressure on a particular part of the artery, and at a part directly opposite; whilst the limb remains free from all compression at any other part of its circumference." In illustration of this method, he mentions a case of popliteal aneurysm, in which, for a whole year, complete quiet, lying in bed, low diet, bleeding every month, and pressure, where the artery passed through the tendon of the *m. triceps femoris*, were employed. "The compression was effected by a semi-circular steel spring, like that of a rupture truss; a screw, with a pad at its end, graduated the pressure on the vessel at will. The pain at first prevented its constant application; but, by gradually accustoming himself to it, and increasing the force, he succeeded in weakening, and then in preventing the pulsations of the swelling, which became adherent, hardened, and reduced to a little tubercle, formed doubtless by the coagulated blood, and adherent to the inside of the aneurysmal sac. The practice of Professor Dubois presents many instances of success by the same means." (pp. 95, 96.)

Compression for the cure of aneurysm, has, however, been little thought of, or employed in this country, till within the last four years, when it was revived by

(*a*) Quoted at head of Article. (*b*) Nosographie Chirurgicale, vol. iv.

Hutton, of Dublin (*a*), for a case of popliteal aneurysm, as large as a hen's egg, as the patient would not submit to the operation of tying the femoral artery. "For three or four weeks he maintained the horizontal posture, and a compress and bandages were applied; but, as the tumour gradually increased in size, and as he suffered pain from the pressure, this treatment was discontinued. On the 1st *Nov.* 1842, Hutton, therefore applied an instrument, "so contrived as to admit of pressure being made by a screw and pad upon the course of the femoral artery, and the counter-pressure upon the opposite surface of the limb, without interfering with the collateral circulation. In the first instance, the compression was made upon the femoral artery in the middle third of the thigh; and, although it was effectual in compressing this vessel, it produced so much uneasiness that it could not be sustained, and, after a few applications, the apparatus was removed, and adapted to the upper part of the limb. *Nov.* 12. The femoral artery was compressed as it passes from the *pelvis* under Poupart's ligament, and the pressure maintained for more than four hours. *Nov.* 14. The tumour feels rather more solid; the purring thrill before felt, on the re-entrance of the blood into the sac, is no longer sensible; the pulsation as before. *Nov.* 22. Duration of compression three hours; the pulsation returned after its removal. *Nov.* 24. Artery compressed six hours; same result. He could not bear pressure next day for soreness in the groin; and he had some pain in the tumour. *Nov.* 26. The compression resumed, and continued for four hours; when the instrument was removed, the pulsation had ceased in the tumour, which felt solid, and was free from pain. *Nov.* 27. The pulsation had in a slight degree returned; compression for six hours. *Nov.* 28. No pulsation was now felt in the tumour. It had decreased in size, and was solid. *Nov.* 29. The compression was maintained for six hours; no pulsation felt; compression applied three hours. *Dec.* 1. An artery, about the size of the temporal, is felt pulsating along the surface of the tumour, which is quite solid, much diminished in size, and is altogether free from pulsation. The use of the instrument was now discontinued. *Dec.* 27. The tumour reduced to the size of a small walnut, and very hard. He was this day discharged at his own request." (pp. 364, 365.) Very soon after the termination of this case, Cusack treated a popliteal aneurysm in the same way, beginning first with a bandage over the whole limb, to which subsequently was added a compress on the aneurysmal sac; this was continued for a month, but without effect. "*Feb.* 22. Hutton applied his instrument, the pad being screwed down on the femoral artery at as high a point as possible, and with a force sufficient to stop completely the pulsations in the tumour; a compress was then laid over the aneurism, and secured by a flannel bandage, beginning at the toes. He soon began to feel uneasy; but when it had been on for one hour and a half, his face became pale, his pulse weak and slow, and he complained of faintness, with a feeling of weight in the situation of the pad, running up to his heart, and a sensation of a rush of blood to his head, accompanied by profuse perspiration on the forehead and vertex; the instrument was now loosened, and he soon rallied. When quite recovered, the pad was again screwed down; but he could not bear it for more than half an hour at a time." The apparatus was continued for five days, the patient screwing down the pad as he could bear it; but no benefit having been gained, it was put aside, and a bandage applied. From the 22d January to the 4th of March, he had been taking ten drops of tincture of digitalis thrice a day; but it was then increased to fifteen drops, which was continued a fortnight longer, and then left off entirely. "*March* 16. Sir P. Crampton's instrument, modified by Mr. Daly, was put on so as merely to lessen the impulse in the aneurism; no compress or bandage was put on the tumour. *March* 18. Bears this instrument much better than the last; has none of the unpleasant rush to the head. * * * No change in the tumour. *March* 22. The tumour is decidedly harder and smaller, the impulse being greatly lessened. At times there is only a thrill in the aneurism; sometimes there is no motion whatever in the tumour, even when the pressure is removed, but it returns on the slightest movement of the body. *March* 23. Pulsation has totally ceased; the tumour is very hard, and about the size of a large walnut; a large artery can be felt running down superficial to the aneurism, over which it can be easily rolled with the finger; it then divides into two branches; the articular vessels do not appear enlarged. *March* 25. The instrument was removed

(*a*) Dublin Journal of Medical Science, vol. xxiii. 1843.

to-day. The femoral artery can be distinctly traced as far as the opening in the tendons of the *triceps* and *vastus internus*. *April* 1. The tumour is decreasing; the enlarged artery above mentioned is much smaller than at the last report. *April* 7. Tumour continues to decrease; the entire artery can be traced until it enters the aneurism; but in the lower third of the thigh, and in the ham, the pulsation is so weak that it can only be felt on a careful examination. *April* 14. The enlarged artery has become very small, while the popliteal artery of the affected limb now pulsates as strongly as that of the sound one; a number of hard cords can be felt passing over the tumour." (pp. 367, 368.) In the spring of the same year (1843) Bellingham (*a*) treated a case of secondary aneurysm of the right external iliac artery, which had been tied by him a twelvemonth before, and though the sac had suppurated and filled by granulation, reappeared on the 1st of *April*. He was kept perfectly at rest in the horizontal posture, from the 3d of that month to *May* 11, five or six ounces of blood twice taken from the arm, and tartar emetic and digitalis given. About ten days after his admission, the integuments became a little discoloured. No farther change, however, occurred: and, on *May* 11, pressure on the *distal side* of the tumour was made, by means of the instrument for compressing the femoral artery in popliteal aneurysm, was commenced; but it appeared rather to increase the pulsation in the tumour." The pressure was continued at intervals, and on the next day the pad was applied to the artery at the origin of the *profunda*. The pressure was kept up the following three days, but discontinued at night; the tumour was smaller, and its pulsation diminished, but after a few days became more perceptible, and the apparatus was therefore left off." Some days subsequently, pressure was applied directly upon the tumour, by means of a compress, adhesive plaster, and bandage tightly round the body." After some days the tumour had diminished in size, and became more flat; the pressure gave no uneasiness, and was continued till the beginning of July, and on the 20th of that month, "some remains of the tumour could still be detected by pressure over its side, but no pulsation or bruit of any kind could be heard; neither can any pulsation be felt in the femoral artery, from Poupart's ligament downwards. *Aug.* 17. No tumour can now be felt; there is merely a little hardness in the situation of the former swelling." (p. 243–6.) In 1844, in another case, which was a femoral aneurysm in a man, who, fifteen months previously, had had popliteal aneurysm of the other limb cured by pressure, Bellingham, after one bleeding from the arm, and fifteen drops of tincture of digitalis for five days, applied the same kind of instrument as that which had cured the disease in the other limb, at the groin, relaxing it at intervals when the pressure became painful. On the third day the instrument, having got out of order, required removal, and was temporarily replaced by a tourniquet pad at the groin, upon which a four-pound weight was placed, and this, with a slight pressure of the patient's hand, stopped the pulsation. On the following day a seven-pound weight was substituted, the tumour was somewhat more firm, and rather diminished in size; but the pulsation was still very strong when the pressure was removed. Ice was applied a day or two after to relieve the heat felt in the evening. On the eighth, a bandage was applied round the limb, from the toes over the tumour, and partly up the thigh, and the original pressure apparatus again put on; but on the twelfth day the weight was resumed, as the patient preferred it. On the nineteenth day, the pressure having been kept up steadily, except at night, whilst he sleeps, "the tumour is evidently more firm, and smaller; the patient suffers no pain when it is pressed or handled, and has lost the uneasy feeling about the limb. To-day an instrument, in form of a carpenter's clamp, was applied, the pad of which was fixed upon the artery in the upper third of the thigh, and he retained it on for several hours. However, as it compressed the femoral vein also, the limb swelled, and he was obliged to remove it towards evening." The pressure was continued on the same principle, but with an improved instrument for the following seventeen days, but the tumour continued stationary. On the thirty-sixth day a second similar instrument, "but with a larger arc, so as to permit the pad being placed over the artery in the groin, was applied, and the patient directed to use it alternately with the other upon separate portions of the vessel; and, when the pressure became painful at one point, to tighten the screw of the other, and then relax it. About three in the afternoon, he fixed the pad of one instrument on the femoral artery, where it

(*a*) Dublin Journal, vol. xxvi. 1845.

passes over the horizontal *ramus pubis*, and the second on the femoral artery lower down, and continued the pressure nearly constantly up to twelve o'clock at night, when, on relaxing the screw, he found that the pulsation of the aneurism had ceased. He, however, persevered in the use of the instruments throughout the night." On the forty-second day, the pulsation had entirely ceased; "a vessel of some size was now, for the first time, felt, which ran superficially in the course of the femoral artery, and had evidently become enlarged since the filling up of the sac of the aneurism. The patient says that last night, about twelve o'clock, when he loosened the screw of the instrument, the aneurism no longer pulsated, from which time he suffered much pain, both in the tumour and about the knee." These symptoms, however, subsided on the following day, when, "in addition to the superficial artery already mentioned in the course of the femoral, the articular arteries about the knee were found enlarged, one of which, on the inside, is nearly as large as the radial artery." On the fifty-seventh day "the tumour was about the size and shape of a small hen's egg, very firm and solid. The pulsation in the femoral artery can be traced from the groin to within a short distance of the obliterated sac of the aneurism." (pp. 248–54.)

Such are the results of the first three cases, in which aneurysm has been treated by compression by the Irish Surgeons, and BELLINGHAM has enumerated (*a*) nine other cases in which it has been employed, three of which have been managed in England by LISTON, ALLAN, and GREATREX, and the rest in Ireland, and all cured. Thus CRAMPTON's assertion (*b*), that "intermediate compression, or compression from without (maintained for a sufficient length of time to allow the blood in the aneurismal sac to coagulate) had been tried and was found ineffectual," (p. 359,) is proved to have been so only on account of the inefficient mode of the application of external pressure. From this account, although I have yet had no opportunity of practising this treatment, I must confess I think it highly worthy of serious attention, and am much disposed to think I should try it on a fitting occasion. BELLINGHAM very justly observes, upon the advantage of alternating pressure upon the artery, that "the principal improvement which has taken place in the treatment of aneurism by compression, consists in the mode of applying the pressure; that is, instead of employing a single instrument, we employ two or three, if necessary; these are placed on the artery leading to the aneurismal sac; and, when the pressure of one becomes painful, it is relaxed, the other having been previously tightened, and, by thus alternating the pressure, we can keep up continued compression for any length of time. By this means the principal obstacle in the way of the employment of pressure has been removed; the patient can apply it with comparatively little inconvenience to himself; time will not be lost owing to the parts becoming painful or excoriated from the pressure of the pad of the instrument; and, as the pressure need not be interrupted for any length of time, the duration of the treatment will be necessarily considerably abridged." (p. 167.) With regard to the treatment of the artery which has been thus treated, BELLINGHAM says:—"It will be observed, from the histories of the cases which have been published, that the femoral artery could be traced, after the cure, to near the sac of the aneurism, proving that the artery is never obliterated at the point compressed." (p. 165.) This is a very interesting circumstance, and supports JOHN HUNTER's opinion, that "the force of the circulation being taken off from the aneurismal sac, the progress of the disease would be stopped."]

1420. As regards the more precise determination of making use of pressure for the cure of aneurysm, it is advised by many to employ it in all aneurysms, so that even if no cure take place, a progressive expansion of the collateral branches may be effected. It may be employed if the aneurysm be still recent, if it be not large, especially when the consequence of an external injury; if there be no circumstances which render a speedy cure necessary; if the patient be not very stout, the limb not very much swollen, and the artery so situated, that its walls can be properly brought together by compression. Where beneficial, it soon shows; the experiment of compression is, therefore, never to be persisted in too long, and it should be left off as soon as circumstances occur which may

(*a*) Med.-Chir. Trans., vol. vii. (*b*) Dublin Journal, vol. xxvii. 1845.

render it dangerous. It is always proper to accompany the pressure with rest, blood-letting, cold applications to the swelling, and the internal use of digitalis, and so on.

Samuel Cooper (*a*) believes, that compression is successful only in about one out of thirty cases, and that a certain number of the successful cases must doubtless be considered rather as spontaneous cures of aneurysm.

1421. *Tying* the aneurysmal artery (the *Operation for aneurysm*) is the most certain mode of treatment; and there are two modes in which it is performed. The one, laid down in the ancient Greek Surgery, by Philagrius and Antyllus, which consists in opening the aneurysmal sac, removing the coagulated blood, and tying the artery above and below it; the other, where the artery is laid bare and tied above the swelling, between it and the heart, upon which the swelling diminishes and disappears (1).

(1) This mode of operation is usually called the Hunterian. Although it had been previouly practised by Anel (*b*) and Desault (*c*), it was, however, first raised to a systematic operation by Hunter (2). In former times, indeed, tying the brachial artery above the aneurysmal sac was performed by Aetius, Paulus, Ægineta, Guillemeau, and Thevenin; subsequently, however, even the sac itself was opened.

[(2) The operation of tying the artery at a distance from the aneurysmal sac, and where its coats are healthy, has been justly claimed by English Surgeons, for John Hunter, notwithstanding that till within a few years our French neighbours have laboriously endeavoured to show that it was merely a repetition of the operation performed by their countryman Anel, at Rome, in January, 1710, and subsequently by Desault, in June, 1785. Honourable exception to this nationality is offered by Deschamps' able vindication (*d*) of Hunter's originality in reference to his operation; and within the last few years his title to it has been almost universally conceded. The circumstances, however, are so interesting in reference to this operation and its importance so great, that a short notice of the operations of Anel and of Desault cannot be here misplaced.

Anel's operation was performed on the brachial artery of a friar which had been wounded in venesection, but which did not bleed till the fifteenth day after the injury, when it was checked by the use of astringents and bandage. Anel's account of the disease is exceedingly confused and probably he did not very well understand its true nature, for, he says:—"From the day of venesection to that of the operation, we see that three kinds of aneurysm have occurred in the same artery of the same arm," a true aneurysm, a false one, and a true one again, upon which last he operated. It is probable, however, that during the whole course of the disease it was none other than the ordinary spurious aneurysm following a wound in an artery, which John Hunter (*e*) observes, "will produce various effects according to the treatment, all of which are called so may aneurisms: but I do not consider a wound in an artery, an aneurism, even if in an aneurism itself." (p. 543.) Anel thus describes the operation performed on the 30th January, 1710:—"Having made myself master of the blood by means of a tourniquet, I made an incision in the integuments without touching, in any way, the anuerismal sac; I then sought for the artery, which I found situated below the nerve, which is not common. I took every precaution in separating it from this, and having lifted it upon a hook, I ligatured it *as near to the tumour as possible*. The artery having been tied I loosened the tourni-

(*a*) First Lines of Surgery. London, 1819. vol. i. p. 304.

(*b*) Suite de la nouvelle Méthode de guérir la Fistule lachrymale. Turin, 1714, p. 257. I have copied this account from Erichsen's Observations, as the copy of Anel, which I have by me, does not contain this notice.—J. F. S.

(*c*) Œuvres chirurgicales, vol. ii. pt. iv.

(*d*) Observations sur la Ligature des principales Artères des Extrémités, à la suite de leurs blessures, et dans les Anévrismes, particulièrement dans celui de l'Artère poplitée, dont deux ont été opérées, suivant la méthode de Jean Hunter, Chirurgien anglois. Paris, 1793; and at end of his Traité historique et dogmatique de l'Opération de la Taille, vol. iv. Paris, 1796-97.

(*e*) Lectures on the Principles of Surgery; in his Works, edited by Palmer.

quet, when a small muscular branch, which I had divided in dissecting the vessel, bled and compelled me immediately to tighten the tourniquet and to tie the artery again a little higher up; the tourniquet being loosened, I saw no more bleeding nor any pulsation in the tumour. I then applied the proper dressings and a bandage." (p. 220.) On the following day pulsation of the artery at the wrist was very distinct. "The first ligature separated on the 17th day of February, 1710; and the second on the 27th of the same month; without the supervention of the least hemorrhage, on the 1st of March in the same year, this friar not only left his room, but went even to church. * * * On the 5th of March the wound was perfectly cicatrized." (p. 221.) In his reflections on the case, Anel observes:—"With regard to the mode of doing the operation, I performed it in a different way to what authors describe, which I have seen good surgeons adopt, and which I have myself had recourse to several times; for instead, as is customary, of applying the ligature above and below the aneurism, I only practised it above. Besides, the aneurismal sac is usual opened, but I did not touch it at all; not doubting but that the blood contained in it would be dissipated, being at liberty to pass on towards the extremity; that the sac, being once empty, would not fill again; that the layers of membrane that formed it would not fail to collapse; and that thus the tumour would disappear, all which happened as I thought. In this way the operation was less tedious, and much less painful; besides, my incision was not half the usual length, hence there was a smaller cicatrix." (p. 223.) The tumour collapsed in such a way that it would have been impossible to have ascertained the spot where the aneurism existed." (p. 222.)

Desault's operation, as stated by Sabatier (*a*), was performed in June, 1785, upon a popliteal aneurysm which "had acquired the size of a turkey-hen's egg; the patient was thirty years of age. * * * Desault made an incision about two inches in length at the upper part of the tumour, laid the artery bare, separated it from the nerve and tied it. * * * On the sixth day he tied a ligature of reserve, that he had placed under the artery above the first one. The state of the wound and of the patient was such as to promise a speedy cure." The tumour diminished to half its size and the ligature came away on the eighteenth day. "On the following day the wound discharged a tolerable large quantity of matter mixed with blood, and the tumour disappeared almost entirely; an evident sign of the rupture of the aneurismal sac. After this nothing was left but a fistulous opening which healed in a few days." (p. 403.)

Erichsen (*b*) observes:—"From the following remark by Maunoir it would appear that little importance was attached to the operation at the time even by Desault himself. 'I lived,' says Maunoir, 'two years with Desault, and I do not remember to have ever heard him speak of this operation. It had not been considered of consequence; and in general, it seemed to me, that it was quoted without being understood and after very vague reports.'" (p. 403.)

Desault's operation was also performed by Pott after Hunter had performed his new operation, in a case of femoral aneurysm of which E. Home gives a brief and not very clear account in the paper presently to be cited from; it did not, however, succeed, and amputation became necessary, at what period, however, Home does not state.

I have heard it mentioned that John Hunter was indebted to Ford, for the suggestion at least, if no more, of his mode of operating in cases of aneurysm. It is not at all improbable that Hunter's mind may have been led to the operation he afterwards practised, from his reflection on the two cases of Ford's, presently to be mentioned; but this appears to be all Ford had to do with the matter, as it is very unlikely he should not have taken notice of the subject, had he any claim to it, in the paper (*c*) he published between two and three years after Hunter's first operation; and, in fact, he utterly discourages any kind of operation. He says:—"An aneurism of the larger vessels, when it occurs in the trunk of the body, is a disease that is usually fatal, and it is not uncommonly so when it happens in the extremities; the mode of cure in the latter case, whether by amputation of the limb or by tying the artery being universally allowed to be hazardous. * * * The cases I now communicate to you serve to establish the fact, that in cases of aneurysm the efforts of

(*a*) Medecine Operato re. Paris, 1796.

(*b*) Cited at head of article.

(*c*) Cases of the Spontaneous Cure of Aneurism, with remarks; in London Medical Journal, vol. ix. 1788.

nature alone, unassisted by art, have produced in the coats of the vessel a coalescence of its sides, firm enough to render the artery impervious to the impetus of the blood, whilst the circulation in the extremity has been amply supported by the collateral branches going off above the aneurysmal tumour." (pp. 142, 43.) The first case he met with, several years previous to publishing his paper, was a popliteal aneurysm in a chairman "He was admitted into an hospital, and at the end of three months, when he called upon me," (again,) says FORD, "I found that the tumour had totally disappeared, and that the limb was wasted, and a little weaker than the other, but that he was capable of doing his business. Upon inquiry, I could not learn that the cure could be ascribed to any other means than to the efforts of nature, with which an horizontal position of the body, and a regular diet, might perhaps have co-operated. This man died soon after of a fever, and as the limb was not examined by dissection, and a doubt arose whether the tumour was aneurysmal or not, the circumstances of the case were not deemed strong enough to justify any inference to be made from it." (pp. 143, 44.) The next case was that of a clothes-presser thirty-six years of age, who had "a tumour situated on the anterior and upper part of the right thigh, about three inches below POUPART'S ligament. It was of the size of a turkey's egg, and had a strong pulsation." He had also, "at the same time, a swelling about the size of a pullet's egg in the ham of the other leg, in which was felt a tremulous pulsation." (p. 141.) Two months after, the swelling in the right thigh had considerably increased; and from the irritation, probably dependent on a mustard poultice having been applied, and a cordial regimen directed by an empiric to promote suppuration, he had a very severe attack of fever, which, however, by proper treatment was relieved. No operation was proposed for fear of mortification and fatal hæmorrhage. "We now examined the other leg," says FORD, "but found no traces left of the swelling I had formerly seen." Six weeks after he died with gangrene of the right thigh, without hæmorrhage. On *examination* of the left ham, "externally there was no mark left of the tumour; but upon cutting down to the vessel, we found the popliteal artery enlarged to the size of a small hazel nut. On opening the artery, both above and below this tumour, and endeavouring to pass a director and a probe, it was found to be quite impervious to the instruments, although some force was used; and upon farther examination, it was found plugged up by a substance of a hard and firm consistence." (p. 148.) The last case was a femoral aneurysm, seen by FORD in September, 1785, when it "was about the size of a middle-sized China orange, and obviously increasing. The situation of it was so high up as to admit of no hope of preserving his life by removing the limb, or by tying up the artery. It was, therefore, only recommended to him to lie in bed, to keep his bowels open by gentle laxatives, and to live upon a very spare diet." (p. 149.) Among the professional people who saw this man, and by whose concurrence compression at the groin was made, but could not be persevered in on account of the severity of the pain, HUNTER is mentioned; but this case could not have encouraged or induced him to perform his new operation, because "for four months (from September) those symptoms continued to prevail which usually precede a fatal termination," and it was only "at the end of six months that the man began to think the pulsation was not so strong in the swelling, and that it had ceased to increase. * * * In the month of March, (three months after HUNTER had operated on his patient,) the circumference of the tumour was much lessened, and the pain had ceased; the tension was also diminished, the inflammation of the skin had given way, and was now become scabious, putting on a mottled look, and appearing in some parts brown, and in others of an orange colour. (pp. 150, 51.) For two months afterwards the tumour continued to lessen. * * * He was sent into the country, where he soon recovered his strength and the use of his limbs so much, that in three months he was able to walk several miles with a stick." After the lapse of two years, he was fully recovered; but "the thigh was two inches and a half in circumference larger than the other, and there was a hard incompressible tumour where the aneurism was, but which gave him no uneasiness." (pp. 151, 52.) From this account, it is quite clear that the second is the only case which could at all have attracted the attention of such a mind as that of HUNTER, and lead to the proposal of his operation; but neither of the three seems to have impressed FORD beyond the importance of quiet, and its adequacy to effect the natural cure of the disease; and from his review of these, as well as of the cases recited by GUATTANI, he infers—"1st. That nature is capable of effecting the cure of many aneurisms solely by her

own efforts. 2d. That these efforts have been successful even when counteracted by improper treatment, as in the (second) case of the popliteal aneurism (no mention, however, is made of such improper treatment in the recital of the case. J. F. S.;) but that a quiet position of the limb, with an antiphlogistic regimen, contributes to the cure. 3d. That the cure by nature is a permanent one. 4th. That the inert mass left behind is not likely to produce any mischief. 5th. That the unsuccessful event of the operation for the popliteal aneurism, does not principally depend on any particular hazard in consequence of an obstructed circulation in the ham, but upon other causes." (p. 155.)

The first notice of JOHN HUNTER's improvement in the operation for aneurysm, was given by EVERARD HOME in the year 1786 (*a*), and in that subsequent, the dissection of the case. He also published another paper (*b*), giving the history of all the cases on which HUNTER operated, together with some by other surgeons. In the first paper HOME introduces the case with the following remarks:—

"The common method of operating in cases of popliteal aneurism having, in many instances, proved unsuccessful, the operation itself has been condemned by some of our most eminent surgeons. If we consider the cases in which it has been performed, and where the patients have died, we shall probably find that in all of them the artery had been diseased at the part enclosed by the ligature, and had either sloughed off, or had been cut through where it was tied, so that the sides of the artery, though brought together, had not remained a sufficient length of time in that situation to unite by the first intention, and the patients lost their lives from the consequent hæmorrhage. The femoral and popliteal arteries are portions of the same trunk, presenting themselves on different sides of the thigh, and are readily come at in either situation; but where the artery is passing from the one side to the other, it is more buried in the surrounding parts, and cannot be exposed without some difficulty. In performing the operation for the popliteal aneurism, especially when the tumour is large, the ligature is commonly applied on the artery at that part where it emerges from the muscles. This will be too limited a space, should it prove diseased for some way higher up; and if the artery should afterwards give way from any of the causes above mentioned, there will not be a sufficient length of vessel remaining to allow of its being again secured in the ham. To follow the artery up through the insections of the *triceps* muscle, to get at a portion of it where it is sound becomes a very disagreeable part of the operation; and to make an incision on the fore part of the thigh, to get at and secure the femoral artery, would be breaking new ground—a thing to be avoided, if possible, in all operations. From these considerations, suggested by the accident of the artery giving way, which happened several times to Mr. HUNTER, he proposed, in performing this operation, that the artery should be taken up at some distance from the diseased part, so as to diminish the risk of hæmorrhage, and admit of the artery being more readily secured, should any such accident happen. The force of the circulation being thus taken off from the aneurismal sac, the cause of the disease would, in Mr. HUNTER's opinion, be removed; and he thought it highly probable that if the parts were left to themselves, the sac, with the coagulated blood contained in it, might be absorbed, and the whole of the tumour removed by the actions of the animal economy, which would consequently render any opening into the sac unnecessary." (p. 391–93.)

1422. The operation for aneurysm is generally indicated—1. If compression be not applicable. 2. When, as regards the position of the artery, it can be employed, but cannot be borne. 3. When the aneurysm, already large, threatens to burst, or has burst. 4. In spurious diffused aneurysm, when the effusion of blood is considerable. The result of the operation for aneurysm is extremely doubtful, if several

(*a*) An account of Mr. HUNTER's Method of performing the operation for the Cure of the Popliteal Aneurism; in London Medical Journal, vol. vii. 1786, vol. viii. 1787.

(*b*) An Account of Mr. HUNTER's Method of performing the Operation for the Cure of the Popliteal Aneurism, containing all the cases on which he had then operated; in Transactions of a Society for the Improvement of Med. and Chir. Knowledge, vol. i. 1793.

aneurysms exist in the same person, if the patient be in years, or weakly, if from the size of the swelling, destruction of the bones and neighbouring parts have been produced, whereby, perhaps, the collateral branches have been closed; if the arterial coats be rigid, or in any other way changed by disease, and compression, by swathing the limb, have been too long employed. The larger the principal trunk to be tied is, the more doubtful is the *prognosis;* the assistance rendered by nature by the enlargement of the collateral circulation is, however, very remarkable, and under the most unfavourable circumstances the treatment often presents the happiest results.

[E. HOME has justly observed, "that surgeons have laid too much stress on the necessity of large collateral branches being present, to ensure the success of this operation; this must have arisen more from their anatomical knowledge, than from observations made from practice, since we find the trunk of the femoral artery may be taken up in any part of the thigh, without producing mortification of the limb. In one patient afflicted with aneurism, whose limb Mr. HUNTER examined after his death, though there was great reason to believe that the artery had been obliterated above the great muscular branch, the limb had been very well nourished." (p. 399.)

As regards the size of an aneurysm, best suited for operation, JOHN HUNTER says:—"I wish never to see one, that can be made the subject of an operation, larger than a walnut before it is operated on." (p. 543.) Surgeons, however, at present, rarely care about the size of an aneurysm, provided the skin be healthy, and there be sufficient space to apply a ligature between it and the heart, on a presumed healthy part of the artery.—J. F. S.]

1423. In the operation for aneurysm, *by opening the sac*, after the circulation into the artery is arrested by the application of a tourniquet above the aneurysmal part, the skin covering the swelling is to be divided by a cut, which must extend from above to below it; the sac of the aneurysm is to be opened in the same direction, all the blood-clot removed, and the cavity cleansed. The surgeon then endeavours to find out the proper opening of the artery, introduces into it a probe or a female catheter, with which the artery is to be raised above the sac and separated from the surrounding parts; a ligature is then to be passed round it with DESCHAMPS' needle (1) and tied. In this way the artery is to be isolated and tied above the swelling. (What will subsequently be said, in reference to the form of the ligature, applies here.) The cavity of the sac is then cleansed, filled lightly with lint, covered with sticking plaster and a compress, and the whole kept in its proper place with a four-headed bandage.

(1) DESCHAMPS' needle is the most convenient instrument for a ligature; if made of silver, it can assume every necessary curve. WEISS's and KIRBY's needles are suitable for some cases of very deep-lying arteries.

As to the numerous varieties of aneurysmal needles, compare—

ARNEMANN, Uebersicht der berühmtesten und gebräuchlichsten Instrumente älterer und neuerer Zeit. Göttingen, 1796, p. 193.

KROMBHOLZ, Akologie, p. 391.

HOLTZE, De arteriarum ligatura. Berol., 1827. 4to., pl. ix.

1424. HUNTER's mode of operation requires the laying bare and isolation of the artery at a suitable distance above the seat of aneurysm (1). It is here especially to be remembered, that the artery should be separated from its surrounding cellular sheath only as far as is necessary to carry around it, with DESCHAMPS' needle, a round, but not too thick ligature, which is to be firmly tied upon the artery with two single knots (2). The ends of the thread should be laid in one or other angle

of the wound, the edges of which are to be brought into close contact with sticking-plaster, in order to effect the cure, if possible, by quick union. The ligature separates, according to the size of the artery, between the eighth and sixteenth day.

I consider tying the artery with a single round ligature, by which its inner and middle coats are divided, (ascertained by the artery forming a swelling above and below the ligature, and by the ligature being heaved up by the impulse of the blood,) with the simultaneous simple treatment of the wound, as the most preferable mode of treatment (*pars.* 283, 285.) The different modifications must, however, be here mentioned, which have been proposed for the more certain attainment of a successful result.

Scarpa (*a*) holds, in opposition to Jones, (who concludes from his own experiments, that the division of the internal coat of the artery, with a single round ligature, favours the formation of a plug of blood, the adhesive inflammation, and the pouring out of plastic lymph within and without the artery,) that this result happens less frequently in men than in animals, that after-bleeding occurs the more quickly, as on the setting up of suppuration, the external coat of the artery is less capable of withstanding the impulse of the blood, and that this happens so much the earlier, as the division of the arterial coats by the ligature-thread resembles more a torn and bruised, than a cut wound. Also that the ligature-thread does not bring both the divided coats together, but only the wrinkled walls of the external. As the internal coat of the artery is very much disposed to adhesive inflammation, and plastic exudation, so a pressing together of the artery is sufficient to bring about adhesion. Upon these grounds, Scarpa prefers, to all other modes, tying the artery with a small band of waxed threads, between which and the artery, a little linen cylinder, smeared with cerate, is placed. In this mode, however, the artery must be laid bare, no farther than necessary to carry the band round it, nor the cylinder be longer than a line, or thereabouts, beyond the ligature, which, for the largest artery, should be about a line. The band must not be drawn excessively, but only sufficiently tight to keep the uninjured walls in close contact. By this plan of tying, a closure of the artery is produced by the actual joining together of the touching walls of the artery. Such flattening of the artery and touching of its walls, had been previously performed with broad ligatures, with the underlaying of a piece of wood or cork (3). Deschamps (*b*), more recently Crampton (*c*), Assalini (*d*), and Köhler (*e*) have attempted to operate with peculiar arterial compresses; these metallic contrivances are, however, dangerous, and in reference to their operation on the coats of the artery, and the parts surrounding it, not comparable to the soft cylinder which adapts itself to the periphery of the artery.

Jones (*f*) advanced the opinion, that, if upon a large artery several circular ligatures be made near each other, whereby as many tears of the internal coat are produced, and the threads be immediately removed, the plastic lymph effused into the cavity of the artery is sufficient for its obliteration. Hodgson (*g*) has, by experiment, disproved this opinion. Travers (*h*) recommended, but subsequently disadvised such treatment. Cases, however, are given, in which the ligature was removed twenty-four hours (*i*), and fifty and a half hours (*j*), after tying, and the cure ensued. Scarpa also has observed, that the closure of the artery follows, if the ligature, with its subjacent linen cylinder, be removed on the third or fourth day; only in weakly

(*a*) Memoria sulla Legatura delle principali Arterie degli Arti; con una Appendice all' Opera sull' Aneurisma. 4to. Pavia, 1817.—Vacca Berlinghieri, A., Istoria di una Allacciatura dell' Iliaca esterna e Reflessioni sull' Allacciatura temporaria delle grandi Arterie. Pisa, 1823.

(*b*) Above cited, f. 1–4.

(*c*) In Medico-Chirurg. Trans., vol. vii. pl. v. f. 2.

(*d*) Grossi.

(*e*) Dissert. sistens quædam de Aneurysmatibus scalpelli ope ra curandis. Berol., 1818.

(*f*) A Treatise on the Process employed by Nature in suppressing Hæmorrhage, &c., and on the use of the Ligature, &c. London, 1810. 8vo.

(*g*) Above cited, p. 228.

(*h*) Med. Chir. Trans. vol. iv. p. 435, vol. vi. p. 632.

(*i*) The Medical and Surgical Register, consisting chiefly of cases in the New York Hospital, by J. Watts, V. Mott, A. H. Stevens. New York, 1818. p. 157–163.

(*j*) Roberts, W.; in Med. Chir. Trans., vol. xi. pt. i. p. 100.

persons is it necessary to leave the ligature till the sixth day. Scarpa, as well as others, have made known cases favourable to this mode of treatment. His mode of applying the ligature with a subjacent cylinder specially facilitates its removal. Scarpa uses a peculiar grooved probe, cleft in front and open, and a small knife for loosening the ligature. The proposals of Palletta and Roberts must be here mentioned; by means of a sliding thread, the tightened principal loop may be again loosened; by Giuntini, one thread is attached to a little roller, in order to draw it out after the loop is cut through; Uccelli introduces a small metal half cylinder between the linen roller and the loop (*a*). Vacca Berlinghieri (*b*) is in favour of Scarpa's mode of tying with the linen roller, but not for the removal of the ligature on the fourth day. The experiments, as regards the temporary ligature on the human subject, are not yet sufficiently numerous to decide whether it should be generally employed, or only in particular cases, perhaps in old subjects and so on. It is always to be remembered, that the removal of the roller acts as an interruption, for it is firmly pressed on the artery by the loop, clings tight to it, and cannot be removed without tearing, even after the loop has been cut through. In order to get rid of the inconvenience dependent on the threads hanging out of the wound, Lawrence (*c*) proposed tying the artery with a fine silk thread, cutting it off at the knot, and closing the wound, (for the same reason, Astley Cooper (*d*) used silk-worm gut previously moistened in warm water,) as the retained knots are either absorbed or enclosed in a cellular capsule. Many cases, however, decide against this mode of tying (*e*). Maunoir (*f*) and Abernethy (*g*), under the supposition that the tied artery retracts actively, and thereby especially produces tearing and secondary bleeding, advised the application of two ligatures, and the division of the artery between (4). The rarity of secondary bleeding after amputation, which has been considered as a reason for the preference of this mode of tying, is on more than one ground inapplicable; experience is opposed to this method of tying; besides, in many cases, it cannot be undertaken, on account of the want of space, or the deep situation of the artery. The application of the so-called reserve ligature, that is, some threads which in case of secondary bleeding may be drawn together, is not only useless, but dangerous, and therefore to be rejected.

[(1) The operation of tying the femoral artery, for popliteal aneurysm, the first upon which John Hunter (*h*) operated by his new method, Dec. 1785, was conducted in the following manner:—"A tourniquet was previously applied but not tightened, that the parts might be left as much in their natural situation as possible; and he began the operation by making an incision on the fore and inner part of the thigh, rather below its middle, which incision was continued obliquely across the lower edge of the *sartorius* muscle, and was made large to give room for the better performing of whatever might be necessary in the course of the operation; the *fascia*, which covers the artery, was then laid bare for about three inches in length, and the artery being plainly felt, a slight incision, about an inch long, was made through this *fascia* along the side of the vessel, and the *fascia* dissected off, by which means the artery was exposed. Having disengaged the artery from its lateral connexions by the knife, and from the parts behind it by means of the end of a thin spatula, a double ligature passed behind it by means of an eyed probe, and the artery tied, by both portions of the ligature, but so slightly as only to compress its sides together; a similar application of ligature was made a little lower; and the reason for passing four ligatures was to compress such a length of artery as might make up for the want of tightness, as he chose to avoid great pressure on the vessel at any one part. The ends of the ligature were carried directly out at the wound, the sides of which were now brought together and supported by sticking-plaster and a linen roller, that they might unite by the first intention. * * * The fourth day, on the removal of the dressings, the edges of the wound were found united through its whole length,

(*a*) Lettera dell' Prof. Scarpa al Dottori Omodei sulla Legatura temporaria delle grosse Arterie degli Arti. Milano, 1823.

(*b*) Seiler's Sammlung von Abhandlungen, u. s. w.—Seiler has made some experiments, and is favourable to Scarpa's temporary Ligature. Ib., p. 156.

(*c*) Med. Chir. Trans., vol. viii. p. 490.

(*d*) Surgical Essays, part i. p. 126.

(*e*) Cross; in London Medical Repository, vol. vii. p. 363.—Cooper, A., Lectures on Surgery, vol. ii. p. 57.

(*f*) Dissert. sur la Section de l'Artère entre deux Ligatures dans l'opération de l'Anévrisme. Paris, an xiii.

(*g*) Surgical Works, vol. i. p. 151.

(*h*) London Medical Journal, vol. vii.

excepting where prevented by the ligatures. * * * On the ninth day after the operation there was a considerable discharge of blood from the part where the ligatures passed out; a tourniquet was therefore applied on the artery above, which stopped the bleeding; and although the tourniquet was taken off a few hours after, no blood followed. The head of a roller was now placed upon the wound, in the direction of the artery, and over that the tourniquet, which was not tightened more than was thought sufficient to take off the impetus of the blood in that portion of the artery. * * * On the fifteenth day some of the ligatures came away, followed by a small discharge of matter, and the tumour in the ham was lessened. * * * About the latter end of January, 1786, six weeks after the operation, the patient went out of the hospital, the tumour at that time being somewhat lessened, and rather firmer to the feel. He was ordered to make some degree of pressure, by applying a compress and bandage, with a view to excite the absorbents to action. * * * March the eighth, the wound which had cicatrized, broke out again, and the patient was taken into the hospital. About the eighth of April, some remaining threads of the ligature came away, and an inflammation appeared upon the upper part of the thigh. In the middle of May a small abscess broke at some distance from the old cicatrix, at which opening some matter was discharged, but no pieces of ligature were observed. Several small threads were, at different times, discharged at the old sores, and the swelling subsided; but the thigh soon swelled again to a greater size than before, attended with considerable pain. In the beginning of July a piece of ligature, about an inch in length, came away, after which the swelling subsided entirely, and he left the hospital the eighth day of July, at which time there remained no tumour in the ham, and he was in every respect well." (p. 394–98.) Among the few remarks which E. Home makes on this case, he says:—"Mr. Hunter now rather disapproves the application of a number of ligatures, in the manner practised in the above case, as these cannot come away without producing ulceration of the artery which they enclose, a tedious process when the ligature is not drawn tight; neither do I believe he would be again inclined to heal up the wound by the first intention, but rather to allow the cut surface to inflame and suppurate, by which he would have it more in his power to come at the artery, should that prove necessary; and probably, by means of the dressings, he might make a gentle compression to assist the ligatures." (p. 399.)

Birch (*a*), of St. Thomas's Hospital, performed, I believe, the second operation after Hunter's mode, in a case of femoral aneurism, resulting from a blow. "On examination I found," says he, "a large tumour extending within two inches of Poupart's ligament upwards, and occupying two-thirds of the thigh; a pulsation could be felt, and there was no doubt of the disease being an aneurism of the femoral artery. * * * On Friday the third of November, (1786.) it was determined to perform the operation. Mr. Cline undertook to compress the artery as it passed through Poupart's ligament, which he easily effected with a hard compress in the shape of a T with a bread basis. It was agreed previous to the operation, that an incision should be carried in a semi-circular form round the upper part of the aneurismal sac, in order to make room for the longitudinal incision necessary to dissect down to the artery. This was accordingly done; and the integuments raised, so as to make room to feel for the pulsation of the artery. Some portion of cellular membrane and some lymphatic glands, were necessarily dissected and removed with my fingers. I then separated the muscular fibres, and tore away the connecting parts, till the artery could be plainly felt in pulsation. It was then necessary to divide a part of the *fascia* covering the artery, which was done by carrying the back of the knife on Mr. Cline's nail, while his finger pressed upon the naked artery, after which the finger and thumb could surround and compress the vessel. An eye probe, armed with a strong flat ligature, was then pressed through the cellular membrane and carried under the artery. This being effected, we had such command of the vessel as to be able to strip it downward and pass another ligature somewhat lower. This last ligature was then tied, the first being left loose to secure us against accident. The threads being separated and secured, the wound was lightly dressed, the tumour left in its natural situation, and the patient put to bed with the loss of only four or five ounces of blood during the operation. No pulsation could be perceived in the tumour after the ligature was tied." (p. 401–403.) He went on well till the seventh

(*a*) London Medical Journal, vol. vii ; in Home's paper just quoted.

day, when it is stated "the tumour grew thinner at one point and seemed as if disposed to ulcerate the integuments. On the evening of the eighth day he became feverish." On the tenth day "the tumour was very thin in one part, and a fluctuation evidently to be felt. The limb was warm and moveable, but the patient was feverish and delirious at night." In this state he continued till the twelfth day, when he became sensible. "The tumour burst and discharged serum and grumous blood; he fainted; the dressings were not disturbed; he slept composedly; fainted again about six o'clock in the evening, and expired." (pp. 404, 405.) The examination after death, in this case, showed "the blood in the tumour very putrid, and the greater part of it fluid; it appeared to be dissolved by putrefaction. Water injected by the external iliac artery escaped freely from the wound at the ligature, where the artery was open, and appeared to have ulcerated at that part. In dilating the artery from the ligature to the heart, its internal surface appeared of a bright red. This appearance lessened at the curvature of the *aorta*, yet it was very evident in its semilunar valves. The *arteria profunda*, which passed off from the femoral artery rather less than half an inch above the ligature, was also inflamed within." There were nearly two inches of the femoral artery between the ligature and the aneurismal sac. (pp. 405, 406.) It may be here added, on Sir Astley Cooper's authority, that the femoral artery in the space between the ligature and the *profunda* contained no clot, which he considered to have depended on the nearness of the latter artery to the ligature having prevented the formation of an internal clot, by the continuous flow of blood into that vessel. I am, however, by no means sure that this was really the case; it is very true that in the preparation which is in St. Thomas's Museum no clot is apparent, as the femoral artery is slit upwards from the ligature to its full extent; but it seems very probable that by the injection of the water that a clot might easily have been disturbed, and when the vessel was laid open that it might have dropped out unnoticed, as at the time of this case, such a circumstance was not much thought of.

(2) The importance of opening the sheath to the least possible extent, which its complete isolation and the application of the ligature, will admit, cannot be too strongly impressed. Nor less important is doing this with the least possible disturbance of the position of the vessel, which ought never to be lifted up nor dragged, as too frequently done. I think it is best after opening the sheath, to separate the artery gently with the director previous to passing the aneurysmal needle behind it. Some persons prefer Deschamps' needle, the curve of which will be found to require adaptation correspondent with the depth and situation of the artery. Others prefer a blunt-pointed flexible silver needle without a handle, for the introduction of the ligature. I do not think it of much consequence which is employed; it is the dexterity and knowledge of the surgeon, not the instrument that he employs, upon which the proper performance of the operation depends. Especial care should also be taken that no nerve be included in the ligature; and if the patient should express great pain at the time the thread is first tightened, there is good reason to believe this has been done, and it will be necessary to make a careful examination, and even loosen the knot, to be sure of the perfect isolation of the artery, otherwise dangerous symptoms will ensue. The size of the ligature should accord with that of the artery to be tied. As to the material, Astley Cooper was accustomed to use Dutch twine, but round strong silk is generally employed, and its strength tested before it is applied, or it may break upon the artery in tying, an accident which I have witnessed more than once or twice. The artery should not be lifted up from its bed in making the knots, but the ends of the forefingers or thumbs carried down the wound to it, and then the tie made. Nor do I believe it needful to draw the silk so exceedingly tight as commonly recommended for the purpose, as it is said, of cutting through the internal coat; it should be drawn so much, that the whole of the internal coat be brought into close contact, and that the silk should indent the external coat of the vessel; in other words, the ligature should be tied moderately tight. I do not believe that cutting through the internal coat is absolutely necessary for the safe application of a ligature. A thread applied around the carotid artery of a dog so loose as not to interfere with the passage of the blood, is sufficient to cause inflammation, which will block it up completely, as was proved by an experiment made by my able master, the younger Cline, and which I myself have repeated with the like result.

(3) In the Museum of St. Thomas's Hospital there are two preparations, in which

the femoral artery was tied with a broad tape and removed after some hours by the elder Cline (*a*), in cases of popliteal aneurysm. In one case, the artery being laid bare, a double tape, about an inch broad, and one piece lying over the other, was passed by means of an instrument behind the artery. The piece of tin which conducted the tape was cut off, and a cork nearly an inch long was laid upon the artery and confined to its situation by means of the upper tape, producing in this way, a sufficient pressure upon the vessel included between the ligature and cork to stop the circulation, and, consequently, the pulsation of the tumour in the ham. The other portion of tape was left loose. The intention of securing the artery in this way was, to compress the sides of the vessel together, and produce union without ulceration. On the ninth day the tapes were removed, and every thing seemed to be going on very favourably when the patient was attacked by a fever, supposed to have been caught from another patient in the same ward, of which he died on the seventeenth day after the operation. On *examination* of the limb after death, it was found that ulceration had taken place, though the whole extent of the artery included in the tape and sinuses were formed both upwards and downwards in the course of the thigh to some distance. In the other case, similarly treated, the operation was successful, but the patient died three months after, of diseased lungs. Both these preparations are in the Museum at St. Thomas's Hospital.

Crampton (now Sir Philip), of Dublin, holding (*b*) that the division of the internal and middle coats is precisely the kind of injury which a diseased artery is least able to bear with impunity; and that, "accordingly, secondary hæmorrhage, or even aneurism, is not an unfrequent consequence of this operation," (p. 358,) adopted a modification of Cline's use of a temporary ligature. "The femoral artery was laid bare, at the usual place, by an incision not exceeding three inches in length, and a tape one-eighth of an inch in breadth, was passed under it by means of an aneurism-needle. The ends of the ligature were passed through the holes in the foot of the *presse-artère*, and then crossed through the hole in its stalk. The artery was gently compressed by drawing the two ends of the ligature in an opposite direction, until the pulsation had ceased. The ligature was then secured by passing a small peg of wood through the hole in its stalk." Soon after he had excruciating pain in the calf of his leg, and this continuing, at the end of two hours Crampton "determined to relax the ligature, as well to ascertain how far the pain was excited by its pressure, as to observe what progress had been made in the process of coagulation; the peg was withdrawn from the hole in the stalk of the instrment, and the ligature was thus left at liberty to yield to any impulse that it might receive from the artery. I watched for five minutes, with my hand upon the tumour, and as the pulsation did not recur, the peg was replaced, so as to secure the ligature at the degree of tension it now possessed." After forty-four hours, the ligature was completely relaxed; there was no pulsation in the ham; and on the following day it was removed, and the patient cured. (p. 365-68.) Dease, of Dublin, also performed the same operation, and loosened the ligature five hours after; but a minute after, "a deep and obscure pulsation was discerned in the tumour, which became more distinct every moment. The ligature was immediately tightened and the pulsation ceased. Nineteen hours after, "the ligature was again completely loosened: we waited with great anxiety for nearly an hour, but the pulsation returned no more." (p. 369.) The patient recovered. Crampton's instrument consists of a short cylinder, having a foot at bottom pierced on either side with a hole for the tape, which having been passed round the artery, has its ends brought up through these holes and then passed through a transverse hole near the top of the cylinder, where they are crossed and tied; a little screw works down upon this tie, by which the ligature can be tightened.

Lisfranc (*c*) says:—"If an artery be of a yellow colour, it is diseased; its sheath must not then be opened, but must be tied with the vessel; he has often seen Dupuytren follow this excellent practice with success." (p. 282.)

He prefers opening the sheath with his nail, rather than by raising it with forceps and cutting it with a knife, or opening it with a director." (p. 282.)]

(4) The application of two ligatures, and the division of the artery between them, as recommended by Abernethy, is now very rarely adopted, and a single ligature

(*a*) In Home's Account of Hunter's operation, above quoted. Trans. Med. and Chir. vol. i. p. 174.

(*b*) An Account of a new Method of operating for the Cure of External Aneurism, with some observations and experiments, &c.; in Med.-Chir. Trans. vol. vii.

(*c*) Clinique Chirurgicale, vol. i.

is certainly preferable; yet I cannot think with ABERNETHY, that his operation is advisable as safest, when the experience of the surgeon who operates is not large. "Though an experienced and skilful operator," says he, "may accomplish this object with very little disturbance of the artery, from its natural situation and connexions; yet I cannot but suspect that surgeons in general may not be so successful, especially in cases where, from the deep situation of the vessel, the surrounding it with a ligature depends more on feeling than on sight." (p. 248.)

It does not appear whether ABERNETHY originally proposed the division of the artery between the ligatures, to admit the retraction of its ends, or whether he was aware of GALEN's advice (*a*) on this point, which was to the same effect. "If the artery be large, says GALEN, "and if it can be cicatrized beyond the aneurysm, the whole of it should be cut through, and oftentimes that very practice prevents the danger from hæmorrhage; for it appears plainly that when a complete transverse division is made, both portions of the artery retract on either side, the one above the part and the other below it."

1425. After the performance of the operation for aneurysm, the limb is to be put into such position, that the artery be not stretched; the patient should be kept in the most perfect bodily and mental quiet, should be surrounded with well-advised assistants, and treated according as inflammatory or spasmodic symptoms occur. After the operation of opening the sac, the dressing is to be renewed every third or fourth day; when the ligatures separate, and the wound is filled with granulations, its edges are to be brought together with sticking plaster. After the HUNTERIAN operation, the wound is to be treated as one which is to be cured by quick union. In these modes of treatment, immediately after the artery is tied, the pulsation in the aneurysmal sac ceases, the swelling gradually becomes smaller, and at last completely disappears. The pulsation, however, shows itself anew, and often very quickly, in consequence of which, the surgeon may fall into error, if he supposes that it results from relaxation of the ligature. The pulsation is rather a proof that the ligature is well applied, and that the blood again passes into the aneurysmal sac by the collateral branches. It is of uncertain duration, and there is generally no fear of enlargement of the sac, which slowly lessens. It must, however, be remembered, after HUNTER's operation, in aneurysm at the bend of the arm, upon the back and palm of the hand, and foot, that in consequence of the numerous anastomoses the blood can again distend the aneurysmal sac (*b*). The pulsation which recurs in an aneurysmal sac, after HUNTER's operation, depends either on the flowing of the blood into that part of the artery between the seat of ligature and the sac, or on the collateral branches which open into the sac, or on the regurgitation of the blood into the sac from the artery below it (1).

WEDEMEIER (*c*) has communicated a case, in which, after tying the femoral artery for popliteal aneurysm, the sac burst in the ham, and bleeding ensued, which rendered amputation necessary.

[(1) GUTHRIE mentions, that "it is not uncommon for a pulsation to be felt in the tumour a few hours, or in a day or two after the operation from this very cause, (the large size and direct communication of the collateral branches with the artery below the ligature,) but it very rarely continues." (p. 153.) I do not think this so common as just stated, for I do not recollect to have noticed it above two or three times. But I do not think that the absence of perceptible pulsation is a positive proof that no blood gets into the aneurysmal sac after the artery has been tied, as most probably

(*a*) Περι φλεβοτομιας θεραπευτικον, chap. 23, vol. xi. p. 313. KUHN's Edit.

(*b*) SCARPA, above cited.—WEDEMEIER; in LANGENBACK's neuer Bibl. für Chir. u. Ophthalm., vol. ii. p. 560.

(*c*) RUST's Magazin für die gesammte Heilk., vol. vi. p 220.

it does for a time; and the distinctness of the pulsation depends merely on the quantity which flows into the sac.

In a case of popliteal aneurysm, for which I tied the femoral artery on Sept. 12, 1840, pulsation was thought to be felt in the sac twenty-four hours after the operation, but I could not satisfy myself that it really existed till the third day. After this, it continued to pulsate feebly, but distinctly, for about two months, when its pulsation again increased a little; and under this condition he left the house at the latter end of December. But the most remarkable instance, with which I am acquainted, was a case of carotid aneurysm as large as a walnut, for which my friend GREEN tied the right carotid artery in April, 1831. The pulsation did not immediately cease on the application of the ligature, but it did in the course of the following hour; on the following day, however, it recurred feebly, and continued, though diminishing, till the seventeenth day, but it never ceased. The ligature came away on the thirty-fourth day, and on the forty-seventh the pulsation was again distinct, though feeble. In the course of the following fortnight the sac increased in size, and the pulsation increased correspondently with it. GREEN thought the aneurysm was situated at the bifurcation of the carotid, and that the pulsation was kept up by regurgitation from the internal carotid. It was a curious circumstance, in reference to this case, that the jugular vein of the same side, on the day following the operation, began to pulsate, and continued to do so frequently though not constantly. The patient had also an aneurysm in the other carotid. Perhaps the preparation in the College Museum of an aneurysm of the carotid artery just before its division, and nearly filled with clot except at the upper part, towards which the current of blood has been directed, may correspond with GREEN's case.—J. F. S.]

1426. Two circumstances are specially to be dreaded after the operation for aneurysm, to wit, *Bleeding* and *Mortification* of the limb.

1427. *Bleeding* is the more to be dreaded; the larger the arterial trunk which has been tied, the nearer the ligature lies to a large collateral branch, or if the tied artery be in a state of chronic inflammation, or otherwise changed by disease. The bleeding generally occurs between the fourth and fifth days, but in many cases later. As soon as it takes place, the artery must be compressed above and below the bleeding part, and if the bleeding be not thereby stopped, the wound must be carefully examined, and the artery taken up afresh. After the operation by opening of the sac, the bleeding may take place from the upper or lower end of the artery, or from collateral branches opening into the sac.

[In HUNTER's first case (*a*), "on the ninth day after the operation there was a considerable discharge of blood from the part where the ligatures passed out," (p. 150,) but it was stopped by pressure with a tourniquet, and did not recur. In his second case, in which the wound was made to unite by granulation instead of quick union, "on the nineteenth day there was an hæmorrhage from behind the muscle, the swelling of which rendered it nearly as difficult to come at the vessel as if the parts had healed by the first intention; the bleeding was stopped by applying pressure, after having lost about 10 or 12 ounces. On the twentieth there was a slight bleeding which was readily stopped, yet five hours afterwards the femoral artery gave way, and he lost about one pound of blood before the tourniquet was applied. The artery was laid bare and tied a little higher up, the patient being very weak and low; in this state he continued till the twenty-third day without bleeding, when it bled again from a small vessel. On the twenty-sixth a considerable hæmorrhage having taken place, he became faint, then delirious, had vomiting with hiccough, and died the same day." (pp. 159, 60.) No bleeding occurred in HUNTER's other three cases.

One of the most interesting and anxious cases of after-bleeding happened under my colleague GREEN's care in 1825, in a case of axillary aneurysm, for which he tied the subclavian artery external to the scalena muscles, on the 2d of August of that

(*a*) Trans. Med and Chir., vol. i. above quoted.

year. Nothing peculiar occurred at the operation. He suffered a good deal from constitutional excitement, which, however, subsided. On the afternoon of the 14th there was a sudden bleeding in a jet of five or six inches, and he lost very quickly, it was believed, more than a pint of blood; it ceased, however, by firm pressure with a wadding of tow kept up for 10 or 15 minutes, after which all the dressings were removed and linen dipped in cold water, and replaced every 10 minutes, was laid over the wound. On the following day pulsation in the wound was observed, but it almost entirely ceased two days after, and on the 26th the wound was healed, all but the middle. The ligature came away on the 29th, that is, 27 days after the operation. Oct. 31. A small sinus still continues open, from which there has been a slight discharge. About midnight, while he slept, a gush of blood occurred from the wound, which was readily stopped by pressure. It was attended with very great pain in his arm. On the following evening bleeding recurred as he was making water; the blood, which was arterial, rose in a jet five or six inches, and was in as large a stream as the wound would permit; it was easily stopped by pressure for an hour and then cold wet rag applied. There was no farther recurrence of bleeding, and he recovered. On the 12th of December pulsation was felt in the radial artery. After this time nothing of importance occurred, and he got well.

From this case and from two or three others I have seen, I think it must be inferred that when bleeding occurs at the wound after the application of a ligature, it is advisable to do as little as possible, unless the bleeding be so great that the patient's life is in immediate danger. Even the continuance of pressure after the blood ceases to flow had better be left alone, as I have already mentioned, in the treatment of some wounded arteries. The strictest quietude, and the application of cold evaporating washes, should be trusted to, and will be oftentimes successful. But the application of a ligature higher up must be always undertaken with great fear of the result, as generally the cause of want of union at the first placed ligature being a diseased state of the artery, it may be justly dreaded that the vessel may be similarly affected still higher up, and that the same consequences will ensue when the ligature begins to separate. I am inclined to think that if the bleeding be so severe as not to admit delay, I should amputate the limb, not that the actual state of the artery would be other than if it were simply tied; but there would be the advantage, if bleeding recurred, of having the opportunity to apply the actual cautery more efficiently than could be otherwise done; and as this practice is very successful, when, after amputation under ordinary circumstances, the sealing up of the artery has not happened, and either without or with its extremity assuming an aneurysmal character, repeated after-bleedings occur, so I think the actual cautery might be applied successfully to a diseased artery in aneurysm.—J. F. S.

In connexion with this subject may be here mentioned the occasional, though rare recurrence of aneurysm, in a sac which had disappeared after tying the artery above it. Two instances of this kind are mentioned by GUTHRIE, (*a*). The first a popliteal aneurysm, for which the femoral artery was tied by GUNNING, of St. George's Hospital, on 27th *April*, 1821, and the patient dismissed cured on the 30th *June* following. On the 20th of *July*, 1825, he was re-admitted under JEFFREYS, stating that the swelling had entirely disappeared soon after he left the hospital in 1821; but that six weeks since he had noticed its return, of the size of a hen's egg, in the upper part of the ham. "The tumour (on his return) occupied the lower third of the thigh, filling up the whole of the popliteal space, and projecting considerably on each side of the limb, between the hamstrings and the exterior muscles situated on the forepart of the thigh. It appeared to consist of three lobes, and was altogether as big as an ostrich egg. The pulsation in it was feeble but distinct, the skin covering it of its natural colour, and he did not complain of much pain." (p. 155.) He would not submit to having the artery tied, but determined on amputation, which, however, was deferred in consequence of violent salivation from taking a scruple of rhubarb and five grains of calomel, till 5th *September*, when the limb was removed "between the tumour and the part where the femoral artery had been tied. A large vessel, which appeared to be the femoral artery, and eight smaller ones, were tied;" but he became faint and sick during the dressing of the stump, and eight hours after died. On *examination*, "the femoral artery was found to be obli-

(*a*) Cited at head of Article.

terated, for the space of half an inch, at the part where the ligature had been applied four years ago, and immediately below it two small branches were observed to enter the continued trunk of that vessel. These branches were equal to half the diameter of the femoral artery. The anastomosing branches, given off above the obliterated portion, were a good deal enlarged." (pp. 155, 56.) The second case was also a popliteal aneurysm, for which the femoral artery was tied by Briggs, 6th *March*, 1829. "The pulsation in the tumour ceased, and it diminished very much in size. It was only in *June* he was able to go to work, when the swelling had entirely disappeared. In *September* it began to appear again with pulsation, both the swelling and pulsation being soon greater than before." Compression of the leg and swelling was employed, but could not be borne. "A hard compress, in fact a narrow roller four inches in length, was applied on the inside of the thigh, just above the knee and above the inner hamstring muscles, which was firmly retained in that situation night and day. This gave him relief by taking away the pain, which was principally felt in the toes and ankle. This compress he wore for two months, at the end of which time the pulsation had ceased, although the swelling had not entirely subsided." (p. 159.) A year after there was no appearance of a swelling.]

1428. *Mortification of the Limb*, after tying the principal trunk of an artery, depends on the impossibility of properly sustaining the circulation in the limb by the collateral branches, and by the anastomoses of the capillary-vascular system. Perhaps such unyielding condition of the collateral vessels as does not admit properly the restoration of the circulation, is also a principal cause of secondary hæmorrhage, inasmuch as the blood is driven with so much more force against the seat of the ligature, and thereby tearing of the artery is easily produced. The circulation is most easily restored in young subjects, and with a certain energy of circulation. After tying the principal artery of a limb, if it be even ultimately well nourished, the limb is always more or less numb, insensible, and has its natural warmth diminished. In proportion as these symptoms are slighter, there is greater hope that the circulation will soon be restored. It is endeavoured to promote the circulation with warm flannel, or warm bags filled with sand or aromatic herbs so applied that the limb is not at all pressed, and renewed as often as they begin to cool. Subsequently warm applications of spirituous or aromatic fluids are to be used. After some days usually sensation and warmth recur, the latter often to a high degree, and continues, although the limb be not enveloped in warm bags or overlays. It is not uncommon that, although subsequently the circulation recur properly, the extreme parts of the limb, to wit, several of the toes, mortify. If, after persisting for several days in the use of the above-mentioned remedies, and of careful rubbing, the sensation and warmth do not return, there is the greatest danger of the limb mortifying. It then swells considerably, becomes bluish, and if the patient do not die in consequence, amputation is the only remaining remedy, but it rarely has a favourable issue.

[Sometimes, although the operation go on favourably, and the ligature-wound heal, yet the aneurysmal sac will burst and discharge its contents; this happened in John Hunter's third operation (*a*), four weeks after the operation, "but it healed up like any other sore, and at the end of three months he was perfectly recovered." (p. 161.)]

1429. As regards the preference of the old, or of the Hunterian operation, it may be assumed generally of the former—*first*, that on account of the usually deep situation of the artery, and of the nerves and veins

(*a*) Home's account, above cited; in Trans. Med. and Chir., vol. i.

connected with it, which parts have changed their natural place, it is always extremely complicated, difficult, and excites considerable injury, especially as the sac is generally in the neighbourhood of a joint; *second*, that if the aneurysm be consequent on an inflammatory, ulcerative, or otherwise diseased condition of the artery, the ligature, although applied both above and below the sac, may be placed on some part of the artery where the walls are not disposed to adhesive inflammation; *third*, that in this operation there is always a considerable quantity of blood lost; *fourth*, that on account of the large and deep wound in the neighbourhood of the joint, *anchylosis* commonly remains, and, *fifth*, that after-bleeding is frequent after opening the sac. On the other hand, by this operation all the coagulated blood is removed from the sac, which, after the HUNTERIAN operation, if not absorbed, in rare cases produces inflammation, suppuration, and bursting of the sac.

1430. The advantages of HUNTER's mode of operation are in general much greater than those of the old; for therein the place for applying the ligature may be selected, and probably upon a part of the artery which is best suited for adhesive inflammation; the operation itself is accompanied with much less difficulty and pain; after-bleeding is more rare; the patient can use his limb as well after as previous to the operation; experience speaks in favour of HUNTER's mode of operation. Finally, in many cases where, on account of the seat of the aneurysm being near the trunk, the opening of the sac is not possible, this operation is alone admissible.

1431. Important, however, as is the superiority of HUNTER's over the old operation, so that by many surgeons it is considered unconditionally as the best mode of operating, yet after what has been already said about the accidents after the operation, the opening of the sac must be conceded if the aneurysm be diffused, and accompanied with much extravasation of blood, and in aneurysm at the bend of the arm (1), on the back and front of the hand and foot. (*par.* 1425.)

(1) SCARPA, WALTHER, and others, consider two ligatures in circumscribed aneurysm at the bend of the arm, as a superfluous proceeding. Compare, on the contrary, the cases given by WEDEMEIER (*a*).

The opening of the sac has also been considered preferable to HUNTER's operation, in those cases in which the aneurysmal sac is very large, and its absorption not to be expected; experience, however, shows that even the largest sacs will gradually diminish.

1432. The proposal of *torsion* of the artery in its continuity by means of a DESCHAMPS' needle (1), AMUSSAT's (2) division and thrusting back of the internal coats of the artery, (*réfoulement de la membrane interne, et moyenne de l'artère,*) and TAVIGNOT's subcutaneous tying of the superficial arteries, must be here noticed.

(1) THIERRY (*b*) and, subsequently, LIEBER have proposed torsion or twisting the arterial tube, instead of tying it, for the cure of aneurysm; and this mode of obliterating the vessel has been practised by them on a living animal. The artery having been exposed, a DESCHAMPS' needle is passed beneath so as to raise it, and then, by means of a stick, a twisting is produced, (without, however, opening the vessel,) proportioning the number of turns to the size of the artery; the wound is then closed, and having nothing extraneous in it, the obliteration is as complete as if it were tied

(*a*) Above cited.

(*b*) THIERRY, De la Torsion des Artères. Paris, 1829.—FRORIEP's chirurg. Kupfertaf., pl. CCXXXIII.

with a ligature. Bérard (*a*) properly objects to this practice, that if the artery be healthy, there is no fear of the ligature causing bleeding by prematurely cutting through it; but if the artery be unhealthy and friable, the twisting will at once cause tearing of its coats.

(2) The thrusting back of the arterial coats with forceps was the result of experiments performed by Caron du Villars, and repeated by Amussat.

In Amussat's *division and thrusting back the internal coats* (*b*), the artery is laid bare by a pretty large cut, as in the ordinary mode of operation, and isolated for some lines. The artery is then seized transversely by the right hand with a pair of torsion forceps, the branches of which, when closed, touch very exactly, so that the vessel lies directly between its branches; a second pair of forceps is then applied with the left hand on the opposite side, at the distance of some lines, also transversely. The vessel is so held with the two pairs of forceps, that the forceps can be laid parallel, and not at an acute angle, and then pretty strongly pressed together. By these means the inner and middle coats of the artery are torn, and only, in the interspace between the two pairs of forceps, remains a ring consisting of all three coats of the artery. The thrusting back of the internal coats is next effected solely by the forceps farthest from the heart, because this, according to Amussat's experience, is sufficient; and the thrusting back of the coats upwards towards the heart is difficult of performance and insufficient. The forceps destined for the thrusting back are supported sometimes by the point, sometimes by the opposite end, on the fixed forceps, and so acting alternately and like a lever, they thrust back the internal coats, first on the one, then on the other side, by which all tearing of the artery is prevented. When the operation is thus completed, the wound is to be closed, and the cure attempted by quick union. Amussat has published numerous experiments on brutes, and the operation also on man, with successful result.

According to Tavignot's plan (*c*), the two ends, laid together, of a silk thread are to be passed through the eye of one small and one large curved needle, and the loop allowed to hang loosely. The smaller needle is to be carried over the artery, the larger one is to take a directly opposite direction to it, is to pass through the hole made by the former, away under the artery, and carried out again at the same hole. From the opening of each needle-track the loop of one and the two ends of the other thread hang down; the one is then pushed through the other; another coloured thin silk thread is passed through each of the loops (so that the loops may, when needful, be again loosened); the two ends are then pulled, by which the loops are drawn together. The ends are fastened to a horseshoe-like instrument.

On examination of arteries which have been subjected to this operation, the following changes are found. At the part where the forceps next the heart was applied the external coat only remained entire; then followed a ring about a line broad, consisting of all the coats of the artery; beneath this again, the internal coats were divided, and thrust back under the cellular coat, to the extent of two or more lines.

(*a*) Dictionnaire de Médicine, ou Répertoire générale des Sciences Médicales—art. *Anévrysmes*, vol. iii. p. 49.

(*b*) Petit Aperçu critique sur quelques Procédés récemment imaginés pour obtenir l'Oblitération des Artères, sans avoir recours à la Ligature. Paris, 1831.—Mitscherlich, C., Ueber Amussat's Methode für die Operation der Pulsadergeschwülste; in Rust's Magazin.

(*c*) De la Ligature sous-cutanée des Artères; in Examinateur Médical, 13–20. Feb. 1842.

At this part which externally felt hard, the area of the artery was considerably diminished by the thrust back and inverted coats, and subsequently still more so by the ensuing swelling and effusion, whereby the complete obliteration was effected.

The various remedies which have been proposed for the treatment of aneurysm, or which have been made use of, are still to be mentioned in historical review.

1. *Cutting into and plugging the aneurysm.* 2. *Suture of arterial wounds*, with a needle and thread wound round it. LAMBERT effected obliteration of the artery by this practice in man, and AMUSSAT in brutes. 3. *Application of a ligature with a running knot*, for the purpose of *gradually* compressing the vessel. (DUBOIS, LARREY.) 4. *Acupuncture;* E. HOME (*a*) thrust a needle into an iliac aneurysm, heated it with the flame of a spirit lamp, and allowed it to remain twenty or thirty minutes. The soft and, notwithstanding its previous tying, still pulsatory swelling, gradually became harder, lost its pulsation, and the needle exhibited hardened clot every time it was drawn out. VELPEAU (*b*) proposes the introduction of a needle into the artery when laid bare, in which it is to remain for at least four days. One needle is sufficient for an artery as large as a feather; two or three are necessary for larger arteries. The same result is effected by means of a thread carried round the artery, and tied on a little pad. According to PHILLIPS (*c*), the thrusting in of several needles into the aneurysmal sac, or the introduction of a silver thread; in sixty hours inflammation ensued, after which the sac shrunk as in HUNTER'S operation. PRAVAZ has proposed to use galvanism, with needles thrust into the sac, in order to excite more quickly the coagulation of the blood. LEROY D'ETIOLLES (*d*) applied the extremities of two compressors, at the distance of some inches from each other, for the purpose of coagulating the blood in the interspace between them; he also applied ice on the part, and used acupuncture and galvanism. 5. *Cauterization* with moxas (LARREY.) 6. The *introduction of mechanical plugs* of wax and so on into the arteries, and the compression of the ends of the artery or ligatures. 7. The *introduction of threads* into the artery (JAMESON, WORMS, AMUSSAT.) 8. Various modes of *compressing the artery* between the rounded branches of forceps, and tying it below this part, according to AMUSSAT'S experiments on brutes.

Compare, LISFRANC, Des diverses Méthodes et des différens Procédés pour l'Oblitération des Artères dans le Traitement des Anévrismes; de leurs avantages et de leurs inconvéniens respectifs. Paris, 1834.

1433. In aneurysms in which tying the artery between the swelling and the heart is impossible, DESAULT (*e*) and BRASDOR have proposed laying bare that side of the swelling farthest from the heart and tying it, for the purpose of effecting obliteration of the artery up to the nearest collateral branches, by the stagnation of the blood in the aneurysmal sac. DESCHAMPS (*f*) followed out this proposal with unsatisfactory result; so also ASTLEY COOPER (*g*). From these cases it has been improperly determined to reject this practice unconditionally (*h*), as it can only answer our expectations *if no branches arise from the artery between the seat of ligature and the sac, or from the sac itself* (*i*). This opinion is confirmed by the observations of WARDROP (*k*), LAMBERT (*l*), EVANS (*m*), BUSHE (*n*) MOTT (*o*), and MONTGOMERY (*p*), who, in aneurysm of the carotid artery, have tied the vessel above the swelling, and effected a cure.

(*a*) Phil. Trans., 1826.

(*b*) Révue Médicale, Jan. 1831, p. 137. Médicine opératoire. Nouv. Edit. vol. ii. p. 66.

(*c*) London Med. Gaz., vol. xxvi. p. 134. 1840.

(*d*) Lancette Française, March, 1835.

(*e*) Œuvres Chirurgicales, vol. ii. part 4.

(*f*) Recueil périodique de la Soc. Médic. de Paris, vol. v. p. 188.

(*g*) HODGSON, above cited, p. 301.

(*h*) BURN'S A., Observations on the Surgical Anatomy of the Head and Neck. Second Edition. Glasgow, 1824. 8vo.

(*i*) HODGSON, above cited, p. 302.

(*k*) On Aneurism and its Cure by a new Operation. London, 1828. 8vo.—Med.-Chir. Trans., vol. xiii. pt. i.—HORN'S Archiv. für medic. Erfahrung. 1825. Sept. Oct., p. 277.—Lancet, 1826, Dec., vol. xi. p. 365.—Magazin der ausländischen Literatur von GERSON und JULIUS, March, April, 1827, p. 343.—The Examination of Arteries after death, ibid., March and June, 1827.—Lancet, vol. xii.

(*l*) Lancet, vol. xi. p. 801; vol. xii. p. 218.

(*m*) Ibid. vol. xiii. p. 187.

(*n*) Ibid. vol. xiv. p. 149.

(*o*) American Journal of the Medical Sciences, vol. v. p. 287.

(*p*) Medic.-Chir. Review, 1830, Jan. In this case the sac enlarged ten weeks after

Dupuytren supposes that the small branches between the sac and the seat of ligature may become useful, as they proportionally afford a passage for the blood, and prevent the too great extension and tearing of the sac. Wardrop also considers the objection of some branches between the sac and the ligature as no necessary reason against the operation.

[The operation of tying the artery beyond the aneurysmal sac, was according to Boyer proposed nearly sixty years since by Brasdor in his lectures, but never performed by him; it was also recommended by Desault, as feasible where it was not possible to tie the vessel between the heart and the sac, but neither did he perform it. The operation, however, was at last undertaken by Deschamps, in a man of sixty years old, who had a femoral aneurysm, seventeen inches in circumference so high up that there was not a finger's breadth between the sac and Poupart's ligament. The vessel was tied below the sac in hope that the blood, arrested in its progress through the vessel, would coagulate. The tumour, however, continued to pulsate and increased so much after the operation that on the fourth day, its bursting being dreaded, Deschamps' compression of the iliac artery being made as it left the belly, "plunged the bistoury into the upper part of the tumour and opened it down to the bottom." * * * A large quantity of fluid blood immediately escaped and he removed a mass of clot and fibrinous concretions larger than the fist. The sac having collapsed, a long space was left between the upper angle of the cut and the compressing pad. He therefore continued the cut upwards as far as the hand of the assistant who was making pressure, so that he might discover the precise situation of the gap in the artery, which he could only see occasionally, being constantly flooded with the blood, notwithstanding the care taken to compress the artery. A long probe was passed into the upper portion of the vessel, which was raised up as high as possible, and the ligature quickly applied, on account of the enormous loss of blood. * * * As blood was seen to flow from below upwards he applied a ligature of wax thread tied with a double knot below the sac. * * * The patient lost such a quantity of blood that he fell into a state of syncope, from which he did not recover; * * * he gradually sunk and died eight hours after the operation." (p. 196-98.) Both operations were performed in a very bungling and inefficient manner; for, as appeared by Deschamps' dissection, in the first, "the ligature included the artery, the femoral vein and a small portion of the great adductor muscle; and in the second, the upper ligature was situated three lines above the aneurysmal sac, and included the femoral artery and a third of the *profunda* which had been pierced by the needle; the ligature of reserve placed above the last, passed between the femoral artery and the *profunda* accurately surrounding the former, the lower ligature applied in the second operation was upon the artery six lines below the sac, and the vein had been wounded by the needle." (p. 199.) From this account it is pretty clear that the higher origin than usual of the *profunda* and its firm connexion with the aneurysmal sac, would have little to do with the fatal result of this horrible operation, the ill success of which, alone to be expected, could not however present any real objection to the operation proposed by Brasdor, if properly performed.

Astley Cooper tied the femoral artery below the sac of an external iliac aneurysm "between the origins of the epigastric artery and of the *profunda*. The pulsation continued, but the tumour did not increase in size after the operation. The ligatures separated favourably. The aneurism diminished so considerably, that it was conceived in a little time, if its diminution continued, it would be possible to tie the external iliac artery above the tumour. The patient went into the country to recruit his general health, where the aneurism burst underneath the *peritonæum*, and he died in consequence of extravasation of blood into the celluar membrane of the *pelvis* and *scrotum*. In this instance, the femoral artery was tied below the origin of the epigastric and circumflex iliac arteries; a current, therefore, continued to pass through the sac into these vessels; consequently the blood was not at rest in the aneurism,

the operation, formed an abscess, on opening which eight ounces of stinking chocolate-like fluid escaped. The opening was enlarged, all the blood clot removed, the sac filled with charpie, and permanent cure effected.—Oppenheim, N. W., Ueber die Unterbindung der grösseren aneurysmatischen Gefäss-Stämme an den, vom Herzen entfernten, Theile der Geschwulst; in Rust's Magazin, vol. xxx. p. 100.—Marjolin et Berard, Dictionnaire de Médicine, vol. iii. p. 60.—Vilardero, Thèse de Paris, 1831. No 158.

and did not coagulate. After the ligature of the artery, the blood was transmitted more readily through the internal iliac than through the arteries which originate below the aneurism, namely, the epigastric and circumflex iliac. The contraction of the sac, therefore, appears to have been the consequence of the diminution of the stream which passed through it, in the same manner as an aneurism contracts, although a current enters it after the ligature of the artery, at a distance from the disease." (pp. 301, 302.)

For some time this operation was entirely given up, and was, perhaps hastily, designated by ALLAN BURNS (*a*) as being "absurd in theory, and experience proves that it is ruinous in practice." (p. 159.) WARDROP (*b*), however, revived it in 1822, considering "that the changes which such an operation produces both in the artery and sac, are precisely those which nature employs when she cures the disease by a spontaneous process." (p. 19.) In the course of his reasoning to prove the superiority of tying the artery beyond the sac, over tying it between the heart and the sac, he makes some very odd and, as seems to me, incorrect observations; for instance, "when the artery is tied on the cardiac side, the blood cannot make its escape, and cannot be pushed through the capillaries into the veins. It must remain in the sac, and must either be absorbed or be evacuated by a process of inflammation and ulceration of the sac." (p. 22.) Now, unless the disease be of long standing, and of such size, that whatever practice be pursued, burst the sac will, it is rare that the bulk of the contents of the sac are absorbed; the greater quantity of the blood is generally fluid, and the rapid subsidence of the swelling, after the artery has been tied above, proves clearly that the blood does make its way into the veins without any "pushing," whilst the remaining coagulated part quietly rests, often for years, without causing any inconvenience, as will be shown by the dissection of ASTLEY COOPER'S and KEY'S cases, hereafter to be mentioned. Inflammation and ulceration of the sac are of rare occurrence, so far as I have had opportunity of observing. WARDROP'S explanation of the diminution of the bulk of the aneurysmal tumour, after tying the distal part of the artery, is one utterly incomprehensible. "The fluid blood," says he, "can find a *ready exit into the trunk* from whence it came, and thus again passes into the circulation, in place of, as in the other case, having to pass through the capillaries into the veins; and, as nature immediately finds a new channel, there is no more blood impelled into the tumour afterwards." (p. 22.) How "the fluid blood can find a ready exit into the trunk from whence it came," is rather puzzling I should think to the blood, which must be constantly "pushed" forward by every fresh portion propelled by the heart; and it must be a very "new channel" indeed which nature finds, if the blood have "a ready exit into the trunk from whence it came." No surgeon who has observed the consequence of a ligature applied between the heart and the aneurysmal sac, presumes to say that "to allow the process of coagulation to go on in an aneurism, it is necessary to put a complete stop to the circulation of the blood in the tumour." (p. 60). HOME (*c*), in describing HUNTER'S operation, speaks only of "the force of the circulation being taken off from the aneurismal sac." (p. 147.) In some of HUNTER'S cases the pulsation did continue; and it is probable that there is always some degree of circulation through the aneurysmal swelling, after the ligature has been applied, although not sufficient to convey an impulse to the walls of the sac, which is only produced when the disease has existed so long that the anastomosing vessels have begun to enlarge and bear a share in the circulation, as they do in spontaneous cure of aneurysm. It is not also "a curious circumstance that the natural or spontaneous process does not affect a cure, on the principle of the Hunterian operation, by *completely arresting* the passage of the blood into the sac;" for, as just noticed, HUNTER'S operation proposes nothing of the kind. Nor is the "natural or spontaneous process in strict conformity with the principle of the operation I (WARDROP) am now endeavouring to establish; that is, by the formation of *a barrier in the artery beyond or at* the distal side of the aneurism." Nor is it correct to state that "in a case of aneurism Mr. MACKELCAN found that nature had nearly completed a cure of the disease on this principle;" for "the carotid artery was plugged up, and

(*a*) Surgical Anatomy of the Head and Neck.

(*b*) Cases of Carotid Aneurism successfully treated by tying the artery beyond the tumour; in Med.-Chir. Trans., vol. xiii. 1825; also On Aneurism, and its Cure by a new operation. London, 1828, 8vo.; from which here quoted.

(*c*) Trans. Med. and Chir., vol. i.

the large aneurismal swelling was filled with a coagulum, leaving only a comparatively small channel for the blood to pass into the subclavian artery;" (p. 61) which was certainly *not a barrier* in the artery beyond, or at the distal side of the aneurysm. The operation of tying the artery beyond the sac may be permissible in some instances when its ligature on the hither side cannot be performed, but the principle on which it must be conducted, and the success which may be therefrom expected, must be otherwise explained than as WARDROP has set it forth.—J. F. S.

With regard to the operation of applying a ligature beyond the aneurysmal sac, LAWRENCE (*a*) observes "the circumstances under which aneurisms are placed, in reference to the trunk, and with respect to such an operation are not always alike; in fact, we may distinguish two cases in which the results of this operation may be very different. In the first place, we might reasonably expect to succeed if we could place a ligature upon an artery leading from an aneurismal tumour, under circumstances that would prevent the current of blood through the aneurism. We should expect here the same result as when we cut off the supply of blood, by placing a ligature between the aneurismal tumour and the heart; but there are very few arteries that are so circumstanced, perhaps the carotid artery is the only one. If an aneurism be situated at the lower part of the carotid artery, suppose the common carotid artery be then tied, we know that no branch is given off between the ligature and the aneurism, by means of which the circulation in the tumour can be carried on; therefore, if it were tied effectually, there could be no current of blood through the tumour, that the coagulation might take place necessary for the cure of the aneurism. Mr. WARDROP first tried the operation in a case of this kind, and it was completely successful. The operation was subsequently performed in a case of aneurism of the carotid artery, and it appeared again to have been completely successful, so far as the contraction of the tumour was concerned; but the patient unfortunately died in consequence of hæmorrhage from the upper orifice of the artery where it had been tied, from the remote orifice of the artery, a circumstance, however, that does not at all diminish the value of the inference that is to be drawn from the operation, as far as regards the principles upon which it is founded. When, however, we come to aneurism on the trunk of the axillary, or femoral artery, the case is different; if we tie the vessel *beyond* the tumour, in either case there are important branches given off between the disease and the ligature, by which, probably, a current of blood will continually be kept up through the tumour. In a case of aneurism of the femoral artery, for instance, we should hardly be able to tie the trunk of the vessel beyond the tumour, above the origin of the *profunda*; if, therefore, the *profunda* be left going off either from the aneurismal sac, or from any part between the aneurism and where the trunk of the artery has been tied, we should expect from the active circulation which would be kept up through the tumour, that the operation would fail. In cases of aneurism of the axillary artery, there are a variety of large branches situated, near to the tumour, so that we could not apply a ligature on the distal side, between them and the tumour itself, and these branches would keep up the circulation of the blood through the tumour in the same way that it would be maintained if no ligature were applied. The two cases seem, therefore, to be very different in point of principle; that in which the aneurism is situated near the trunk, and where the vessel gives off no branches between the disease and the ligature; and that in which it is so situated, that numerous branches are given off between where we can apply a ligature, and the situation of the aneurismal tumour. Still, as I have already said, the question is one of experience, and, until it has been fairly tried, we cannot venture to assert that the application of a ligature on the trunks of both femoral and axillary arteries *beyond* the aneurismal tumour, may not be effectual." (p. 165.)]

(*a*) Lectures in Lancet, vol. ii. 1830.

Second Section.—OF ANEURYSM IN PARTICULAR.

I.—OF ANEURYSM OF THE CAROTID ARTERY AND ITS BRANCHES.

1434. Aneurysm of the carotid artery is usually situated at its bifurcation; it has, however, been noticed on various parts of its common trunk, near its origin, and on its branches, the ophthalmic, temporal, and others. The *diagnosis* rests on the general symptoms which characterize aneurysms; with which it is also to be remarked that the aneurysm does not move in swallowing, like pulsating swellings of other kinds, in the neck, which, for the most part, are connected with the thyroid gland. Besides, it is generally accompanied with violent tearing pain in the entire half of the head, beating in the head, sudden loss of recollection, and, according to the different seat and size of the aneurysm, difficulty in breathing.

Burns (*a*) has often felt an enlargement of the common carotid, and of the root of the internal carotid, after death and twice during life, forming a swelling as large as a filbert nut, which caused no pain. I have noticed such an expansion in a strong young man, upon the bifurcation of the carotid, which arose after violent exertion; excepting a violent beating it was unaccompanied with any inconvenience, and did not increase for several years. Syme, J. (*b*), observed a case of aneurysm of the internal carotid artery, which formed a pulsatory swelling in the throat; and, from its situation, resembled an abscess in the tonsil. Tying the carotid artery did not stop the pulsation, and the patient died.

1435. Tying the carotid artery is the only remedy which can be employed in aneurysm of that vessel, if the seat and size of the swelling especially permit.

Acrel (*c*) has restored the artery in an expansion (*Aneurysma verum*) of the trunk of the carotid artery, by gradual and strong compression as the place permitted, after four or five months, to its natural strength.

1436. Numerous observations have proved that, after tying the common trunk of the carotid artery, the brain is sufficiently supplied with blood, and that no disturbance of its functions ensue. Besides the numerous small anastomoses, the carotids of both sides communicate, and the vertebral arteries, by large inosculations in the region of the cellular sinuses, of the cuneiform process of the occipital bone, the *falx*, and the halves of the *cerebellum*, but especially by one peculiar branch from the deep artery. The vertebral arteries at the same time assume the function of collateral branches.

Tying the carotid artery (previously undertaken by Abernethy (1) and Lynn in wounds) was first and afterwards frequently performed for aneurysm by Astley Cooper (*d*). Macgill (*e*), in the space of one month, tied both carotid arteries for tumours of both eyes. Several months after the operation, the patient was well and the swellings had subsided. Mussey (*f*) tied both carotids at an interval of six weeks, on account of inosculating arterial swellings, and the case recovered.

(*a*) Observations on the Surgical Anatomy of the Head and Neck, p. 163.

(*b*) London and Edinburgh Monthly Journal of Med. Science, Nov. 1842.

(*c*) Chirurgische Vorfälle, vol. i. p. 253.

(*d*) Account of the first Successful Operation performed on the common Carotid Artery for aneurysm, in the year 1808, with the *post mortem* examination in Guy's Hospital Reports, vol. i. p. 53. Jan. 1836.

(*e*) New York Medical and Physical Journal, vol. iv. p. 576.

(*f*) American Journal of Medic. Sciences, vol. v. p. 316.

[(1) Abernethy was not the first person who tied the carotid artery; for Hebenstreit, in the fifth volume of his translation of Benjamin Bell's *System of Surgery*, mentions a case which he had met with, where the external carotid artery was wounded in the extirpation of a schirrhous tumour. The profuse hæmorrhage which instantly ensued would soon have destroyed the patient, if the surgeon had not immediately recollected himself and tied the trunk of the artery. "The operation was successful, and the patient lived many years after it."(*a*)

Abernethy's operation (*b*) was performed about 1798 or 9, on a man whose neck was gored by a cow. The horn "had passed beneath and torn the internal carotid artery, and all the branches in front of the external carotid artery. The former vessel was not, however, entirely rent asunder, so that the general course of the artery, and its connexion with the *cranium* remained in the usual state." (p. 117.) The vessels did not at first bleed, but soon did, but this was checked by pressure on the common carotid artery, which could not, however, be borne, and the patient's struggles removing the pressure, repeated bleedings ensued. The wound was therefore enlarged, the artery found and tied, but he died thirty hours after the ligature had been applied. (p. 125.)

Fleming (*c*) successfully tied the carotid in 1803, for secondary bleeding, in a sailor who had attempted to commit suicide. The wound had healed so rapidly that on the seventh day the ligature was completely buried in granulation, and required removal by a cautious dissection." (p. 4.)

The common carotid artery was first tied by Astley Cooper (*d*), in November, 1805, for aneurism of the right carotid, the ligatures were drawn from the wound on the eleventh day, but the woman died on the nineteenth day, having suffered much from difficulty in swallowing. He tied it in another case in June, 1808; the upper ligature came away on the twenty-second, and the lower on the twenty-third day, and this patient recovered. The account of the state of the vessels thirteen years afterwards will be found below.

Travers (*e*) tied the carotid artery in the following year successfully for a case of aneurism by anastomosis in the orbit, in a woman of thirty-four years of age.

The carotid artery has since been tied frequently with success; and there is one very interesting instance in which Dr. Robertson, of Edinburgh (*f*), operated in a case where an aneurysm had burst into the *œsophagus*, and the space was so little, that the artery was taken up only half an inch above the bifurcation of the *arteria innominata*; the ligature came away on the seventeenth day, and the patient recovered.

Zeis, of Dresden (*g*), tied the carotid artery in an infant of fifteen months for a vascular *nævus* on the left side of the face. After having exposed the edges of the *m. sterno-mastoidcus*, a vein about the thickness of a quill, was found lying across the bottom of the wound; this he tied and divided. There was not any arterial hæmorrhage, but dark venous blood oozed out, which was stopped by the application of kreosote water. On opening the sheath, and exposing the internal jugular vein, another large gush of blood ensued, and was stopped by kreosote water. The vein which had been tied swelled so much as to excite fear of its bursting, and was therefore tied again higher up; after which the artery was tied with a silk thread. The tumour immediately became smaller and paler, shrivelled up, and exhibited in various spots, a greenish yellow colour, like an *ecchymosis* of four or five days standing. On the fourth day the ligature on the vein came away, and on the following night a considerable venous bleeding took place, which recurred six times in the course of the next twenty-four hours, but each time was arrested by the kreosote water. On the evening of the eighth day the ligature came away; the bleeding ceased, and after seventy-two days the wound had healed. Several weeks after the operation, the tumour had increased with the nutrition of the body, and became very large, when the child cried. About a week before the complete healing of the wound, the child was attacked suddenly with convulsions and *hemiplegia* of the

(*a*) Scarpa Wisharts' Translation, note, p. 409.

(*b*) Surgical Works, vol. ii.

(*c*) Medico-Chirurgical Journal, vol. iii. p. l.

(*d*) Medico-Chirurgical Transact., vol. i. p. l.

(*e*) Med.-Chir. Trans., vol. i. p. 222.

(*f*) Dublin Journal of Medical Science, &c., vol. xii. p. 335. 1838.

(*g*) Zeitschrift für die gesammte Medicen, vol. iii. part 1.

right side; these symptoms continued with increasing debility, and on the forty-ninth day after the attack of convulsions, the child died. The vascular *nævus* had for some days disappeared, leaving only a few folds of the skin. No examination was allowed.

Kuhl (*a*), of Leipzig, has tied both carotids with success at an interval of twenty-seven days, for a pulsating aneurysmal tumour of the scalp, consequent on wound on the *occiput*, from which there were repeated bleedings. The application of the ligature was followed by convulsions, other troublesome symptoms, heaviness and throbbing of the head, for which it was necessary to employ venesection, though the case at last did well.]

1437. *Tying the common trunk of the carotid artery* may be performed at three different places, according to the different seat of the aneurysm, viz.: *first*, immediately above the collar bone; *second*, below the part where the *m. omo-hyoideus* crosses the carotid; *third*, above that point. If the seat and extent of the swelling do not permit the ligature below the aneurysm, it must be applied above (*par.* 1433.) The patient is to be placed horizontally upon a couch, the head supported by a pillow, and the diseased side of the neck turned properly towards the light.

1438. In tying the carotid artery *immediately above the collar-bone*, a cut of two inches and more should be made through the skin and *m. platysma myoides*, from the top of the breast-bone along the inner edge of the *m. sterno-cleido-mastoideus*. When the edge of this muscle is laid bare, it must be separated from its cellular connexion with the *m. sterno-hyoideus* and *sterno-thyroideus*, and drawn outwards, whilst the latter two muscles are drawn inwards, with a blunt hook, by an assistant. The *m. sterno-cleido-mastoideus* is now to be relaxed by inclining the head to the affected side. The internal jugular vein appears in the wound, and must be drawn outwards, with the forefinger of the left hand from the artery, the sheath of which is then to be opened with delicate and careful strokes of the scalpel; or, when the vein has been fixed externally by an assistant, the sheath is to be raised with forceps, and carefully cut into; the artery should be carefully isolated with the handle of the knife, and the ligature applied round it with Deschamps' needle.

The operation is always most difficult at this part, on account of the depth of the artery beneath the *m. sterno-cleido-mastoideus*, and because it is entirely covered by the jugular vein.

Zang (*b*) has proposed that an incision, beginning from the top of the cricoid cartilage, should be carried outwards *between the two portions of the m. sterno-cleido-mastoideus*, and terminate at a quarter of an inch from the collar-bone; the skin and *m. platysma myoides*, and the edges of the wound must be kept asunder with the blunt hook, the cellular tissue and *fascia* of the neck divided, and thus the triangular space formed by the sternal and clavicular insertion of the sterno-mastoid muscle reached. The internal cervical *fascia* is then to be cut through, the thyroid gland drawn inwards, the jugular vein and pneumo-gastric nerve outwards, the artery taken hold of by the forceps, gently raised, and a ligature passed with a proper needle close to the part where the artery is covered by the *m. omo-hyoideus*.

According to Dietrich's proposal (*c*), an incision is to be made on the mesial line of the windpipe, from the semilunar notch at the top of the breast bone, to the cricoid cartilage, from two and a half to three inches in length, through the skin, cellular tissue, *m. platysma myoides*, and external cervical *fascia*, by which the small veins running from above downwards are avoided. The tendinous connexion between the *m. sterno-hyoides* and *sterno-thyroideus* is then to be divided, the edges of the

(*a*) Radius und Clarus, Beit. zur prakt. Heilkunde. Leipz., vol. ii. p. 245.
(*b*) Blutige Operationen, vol. i. p. 233.
(*c*) Above cited, p. 162.

wound drawn asunder with a blunt hook, and the muscles just mentioned pushed from the windpipe, with the handle of the knife, and carried towards the shoulder. The branches of the inferior thyroideal vein, as well as the thyroid gland, which appears from the middle to the upper end of the wound, must be avoided. The finger is to be introduced into the wound downwards and outwards, after the cellular tissue has been divided with the handle of the knife, and the vessel is felt enclosed in its sheath, which is then to be opened, the artery a little raised and the ligature introduced.

As upon the left side the carotid artery lies deeper and nearer to the *pleura*, the jugular vein and pneumo-gastric nerve higher, and the thoracic duct close behind the sheath of the artery, the performance of the above mode of treatment the more difficult.

The following method, proposed by Coates (*a*), is more easy and more sure. A cut from two to two and a half inches long, is to be carried upwards from the upper edge of the breast-bone, upon the inner edge of the sterno-mastoid muscle; from the lower end of this incision, a second is to be made parallel to the upper edge of the collar-bone, to the inner edge of the clavicular part of the sterno-mastoid muscle, about an inch and a half long, the cellular tissue *m. platysma myoides*, and external cervical *fascia*, is to be divided into two cuts. A director is then to be carefully thrust under the sternal portion of the sterno-mastoid muscle, which should be cut through three lines from the upper edge of the collar-bone, together with the internal cervical *fascia*. The flap is turned somewhat upwards, and held back with a blunt hook. The cellular tissue is then to be divided, and if there be much fat, it must be removed partly with the scissors, forceps, or bistoury, so that the vessels, with their sheath, behind the collar-bone, and on the outer edge of the *m. sterno-hyoideus* may be brought into view. These muscles are to be inclined with the handle of the knife towards the wind-pipe, and the sheath opened with the greatest care, and without any violence, as the delicate walls of the thoracic duct, which lies close behind the sheath, are torn with the slightest violence. The isolation and tying of the artery is effected in the way already described.

1439. If the aneurysm be higher up, the tying of the carotid artery must be effected *below the part at which the m. omo-hyoideus crosses*. A cut is to be made through the skin and *m. platysma-myoides*, in an oblique direction along the inner edge of the *m. sterno-mastoideus*, commencing at the top of the cricoid cartilage, and terminating an inch from the sternal end of the collar-bone. When the edge of the sterno-mastoid muscle is exposed, it must be separated carefully from the sterno-hyoid muscle, and drawn outwards; the omo-hyoid muscle then appears crossing over the vessels of the neck, and the carotid artery, jugular vein, and pneumo-gastric nerve enclosed in their sheath, with the descending branch of the hypoglossal nerve upon it. The omo-hyoid muscle is now to be drawn outwards and upwards, the thyroid gland inwards, and the jugular vein with the forefinger of the left hand outwards, and there kept (1). The sheath is now to be opened, immediately where it covers the carotid artery, either with a director, or, if carefully raised with the forceps, with the scalpel held flat, or, what is best, with some careful strokes of the scalpel. The artery should now be separated from the surrounding parts with the handle of the knife, to an extent sufficient for passing around it the ligature with Deschamp's needle.

As the swelling up of the jugular vein often renders the isolation of the artery very difficult, this may be facilitated by applying compression on the vein above, with the finger. For the purpose of not injuring the important surrounding parts in isolating and tying the artery, it is to be borne in mind that the jugular vein lies on its outer side, and upon it; the pneumo-gastric nerve between the vein and artery, and the sympathetic nerve behind them. As important varieties in the course of the

(*a*) Medico-Chir. Trans., vol. xi. pt. ii.

vessels of the neck, in connexion with this operation, it must be remembered that the division of the carotid artery often takes place deep in the bottom of the neck, and that the vertebral artery arises from the *aorta*, or the subclavian ascends along the side of the carotid, and close behind it. If the artery be laid bare, as proposed, to a great extent, two ligatures must be applied, and the artery tied at the upper and lower part of the exposed portion (*a*).

[(1) Astley Cooper (*b*) observed in his first operation for carotid aneurysm, that "the motion of the internal jugular vein produced the only difficulty in the operation, as, under the different states of breathing, it sometimes presented itself to the knife tense and distended, and then as suddenly collapsed." (p. 3.) This, however, is not always the case, as in an instance mentioned by Hodgson where the carotid artery was tied for a spurious aneurysm, the result of wounding the vessel with a penknife, "the jugular vein afforded no trouble in the operation; it was not even seen." (p. 332.) And in another operation, by Dr. John Brown, of Meath (*c*), for wounded carotid by a penknife, the vein "did not appear, nor was it a source of the slightest inconvenience in the operation." (p. 305.)

If, however, the vein be wounded in the operation, it must be tied as was done by Simmons, of Manchester (*d*).]

1440. If the carotid be tied *above the crossing of the m. omo-hyoideus*, (which is only possible when the aneurysm is seated in the branches of that vessel, or when the aneurysm is deep, and the artery must be tied above it,) the cut must be carried either from the top of the cricoid cartilage two inches upwards, in the direction of the inner edge of the sterno-mastoid muscle, or commenced at the upper edge of the thyroid cartilage, and, on the contrary, carried down a sufficient length along the inner edge of the sterno-mastoid muscle. In this case the operation is to be proceeded with as before, only the omo-hyoid muscle must be drawn downwards. In other cases, when the skin, *m. platysma myoides* and cellular tissue are divided, the edges of the wound must be held asunder, a thin layer of cellular tissue divided; and, in the triangular space formed at the lower end of the wound, by the crossing omo-hyoid muscle, at the upper end of the wound, by the digastric muscle, and externally, by the inner edge of the sterno-mastoid muscle, the artery must be isolated, as already mentioned (*e*).

The superior thyroideal vein above the cricoid cartilage, crosses the common carotid artery, and with it the laryngeal and pharyngeal vein, as well as some branches anastomosing with the external jugular vein, run together before the carotid, and partially form some anastomoses. These veins must be avoided, and drawn upwards (1), and the superior thyroideal artery inwards.

[(1) I have on one or two occasions seen these veins wounded in tying the carotid artery; they bled very freely, but were soon stopped by a little pressure.—J. F. S.]

1441. When in one or other way the ligature has been carried round the carotid artery, it must be fastened sufficiently tight with two single knots; the one end of the ligature cut off near the knot, the other brought out of the wound by the shortest course, and the union of the edges of the wound effected with sticking plaster. Such symptoms may occur after the operation as have been already generally mentioned. The patient should be kept quiet in bed, with his head somewhat raised, and bent forwards. On the fourth or fifth day the dressing is to be renewed. The patient should be treated antiphlogistically, according to the symptoms, and with suitable antispasmodics, if cramps come on. After tying the carotid, it is not uncommon that, on account of the great anastomosis,

(*a*) Hodgson, above cited, p. 342.
(*b*) Med. Chir. Trans., vol. i.
(*c*) Dublin Hospital Reports, vol. i.
(*d*) Cyclopæd. of Pract. Surgery, vol. i. p. 262.
(*e*) Dietrich, above cited, p. 180.

the pulsation in the sac reappears; no farther increase, however, is to be feared; it gradually becomes weaker, and the sac diminishes.

For the history of the ligature of the common trunk of the carotid artery, and the collection of the hitherto known cases, see DIETRICH (*a*).

[The following is the account of the dissection of the second case in which ASTLEY COOPER tied the left common carotid artery in 1808, for aneurysm (*b*), the patient having died thirteen years after of apoplexy (*c*). "The disease of which he died sufficiently attested the freedom of the circulation, as well as its force in the cerebral vessels, on the side on which the carotid had been tied. The arteries on the left side of the brain were rather larger than those on the opposite side. The anterior cerebral artery was of the same size as its fellow: the middle cerebral larger than that on the right side, which was filled with coagulum and did not admit the injection. The large size of the latter vessel is accounted for by the increased size of the communicating branch; which receiving its blood from the basilary, had become as large as an ordinary radial artery. The basilary appeared to be of its usual capacity, although it was evidently the channel which supplied the middle cerebral artery. The blood probably found an easier course from the basilary, through the left communicating branch, than into the right corresponding vessels, which appeared rather diminished in size. From an inspection of the base of the brain after the vessels had been injected it immediately struck the observer, that the left side of the arterial circle of WILLIS was much more developed than the right, and that the left side of the brain received its full share of arterial blood. The anterior cerebral artery received its supply from its fellow by means of the transverse branch: these vessels seemed to be of their usual size. The internal carotid was pervious for about half an inch, and of its ordinary capacity. The external vessels were not so well displayed. Those of the face did not receive the injection. The common carotid trunk was impervious throughout its whole extent, being reduced to a mere cord. The external carotid was injected at its commencement: and the superior thyroideal was filled from the arteries of the opposite side; but beyond this the arteries were empty and therefore could not be satisfactorily traced. The free communication of the branches of the external carotids, in their natural state, affords an ample channel of supply, when the circulation in one is cut off. The aneurism must, as Sir ASTLEY COOPER suspected, have been situated in the internal carotid artery. (p. 57.) The preparation of the carotid arteries of this case is in the Museum at St. Thomas's.]

1442. If an aneurysm be seated in the branches of the carotid, the tying of the affected artery must, if possible, be performed. This tying may also be required on account of other diseased conditions. We must therefore consider tying the external carotid, the lingual, the external maxillary, the temporal, the occipital, and the posterior aural. Tying the superior thyroideal artery will be mentioned in the treatment of *bronchocele*.

1443. *Tying the external carotid artery* is considered as one of the most difficult operations, on account of the vessel being surrounded with arteries, veins, and nerves, and therefore also it is usually recommended to tie the common trunk instead of it (*d*). It has, however, been performed successfully by BUSHE (*e*), on account of aneurysm by anastomosis: by MOTT (*f*) in removal of the lower, and by LIZARS (*g*) in that of the upper jaw-bone.

DIETRICH (*h*) has proposed the most convenient mode of operating; a finger's breadth from the lower edge of the lower jaw, at a distance of half an inch from the inner edge of the sterno-mastoid muscle towards the *larynx*, a cut should be made obliquely upwards, and parallel to the

(*a*) Above cited, p. 132.
(*b*) Med. Chir. Trans, vol. i. p. 222. 1809.
(*c*) Guy's Hospital Reports, vol. i. 1836.
(*d*) MANEC, above cited, pl. iv.
(*e*) Lancet, 1827–28, vol. ii. p. 482.
(*f*) American Journal of Medical Sciences, vol. ix. 1845.
(*g*) Lancet, 1829–30, vol. ii. p. 54.
(*h*) Above cited, p. 186.

edge of the sterno-mastoid muscle, through the skin, cellular tissue, and *m. platysma myoides*. After the division of a thin layer of cellular tissue, the external cervical *fascia* appears, upon which run some veins, which are to be raised, and the *fascia* and the cellular tissue divided with the handle of the knife. The internal cervical *fascia* is then to be cut through with slight strokes of the knife, and, whilst the edges of the wound are held asunder with blunt hooks, the inner edge of the sterno-mastoid muscle appears on the outer edge of the wound; at its inner edge the tongue-bone is felt; at the upper angle of the wound are seen the submaxillary and parotid gland; at the under edge, the digastric muscle; and at the lower angle the omo-hyoid. With the greatest care the fat and cellular tissue filling the bottom of the wound must now be divided, keeping towards the upper angle of the wound, for the purpose of best avoiding the venous branches, to wit, the superior thyroideal, sublingual and facial, and thus the artery is exposed, partially covered by the common trunk of the facial veins. Now begins the most difficult part of the operation, to wit, the isolation of the artery from the surrounding important parts. At the upper angle of the wound the artery crosses the lower edge of the digastric muscle, as well as the principal trunk of the hypoglossal nerve, which runs parallel to the edge of the muscle; on the inside some twigs pass down from the hypoglossal nerve, and, at the same time, the superior thyroideal artery and vein run down from above to the internal jugular vein. The trunk of the facial veins lies in part upon the artery, and upon the wall of the artery descends a branch of the hypoglossal nerve. On the outside of the artery are the internal carotid artery, and the internal jugular vein, which frequently covers the latter artery; together with them descend the pneumo-gastric and sympathetic nerves, which divide into many branches. Between, and rather behind the two arteries, passes up with, and very near it, the ascending pharyngeal artery, from the external carotid. The laryngeal nerve, as well as branches of the hypoglossal nerve, cross it deeply, passing on the back and inner part inwards and upwards. The external carotid artery is best tied either above the giving off of the superior thyroideal, or where it crosses the lower edge of the digastric muscle. This muscle, and the hypoglossal nerve, must therefore be somewhat separated from the cellular sheath, and with the submaxillary gland drawn upwards with a hook by one assistant, whilst another draws the internal carotid artery, the internal jugular vein, and the nerves outwards. When the operator has now in part pressed the trunk of the facial veins lying on the artery, aside and inwards, he opens the sheath of the artery with the handle of the scalpel, and passes the ligature with DESCHAMPS' needle from without inwards.

1444. BECLARD (*a*) has proposed *tying the lingual artery* in bleeding after deep extirpation of the tongue, and the like. Tying it on one side is sufficient, as the bleeding from the other side of the tongue may be staunched by cauterization. The patient lies with his head somewhat bent back, and with his face turned towards the sound side; the operator thoroughly satisfies himself of the position of the tongue-bone, which,

(*a*) MANEC, above cited, pl. iii.—BELL, CHARLES, Operative Surgery, vol. ii. p. 307.—WISE; in AVERILL, above cited, p. 53.

during the whole operation, must guide him, and makes a cut from an inch to an inch and a quarter long, which he commences a little behind the horn of the tongue-bone, and carries upwards and forwards, half an inch over the body of that bone. The skin and *m. platysma myoides* are thus divided, avoiding the facial vein, which is to be turned backwards. The cellular sheath of the submaxillary gland is then to be opened, and the gland raised without injuring it, upon which the digastric and stylo-hyoid muscles, as well as the hypoglossal nerve, appear. If these different parts be very near the tongue-bone, as happens with persons who have short necks, they must be gently raised, so as to expose the outer side of the hypoglossal muscle, some fibres of which are to be seized with the forceps, raised, the director introduced under them and then divided, upon which the artery is exposed, and easily isolated.

Dietrich (*a*) makes the cut as in tying the external carotid artery, only with this difference, that he begins three lines from the under edge of the lower jaw, and carries it two inches downwards, through the skin, cellular tissue, *m. platysma myoides*, and external cervical *fascia*. The vein being avoided, and the second *fascia* divided, the edges of the wound are to be kept asunder with hooks, when the submaxillary gland and lower edge of the digastric muscle appear at the upper angle of the wound. The cellular tissue, connecting the gland with the muscle, is to be divided, and the gland raised up, which exposes the stylo-hyoideal muscle. Both muscles and the hypoglossal nerve are to be drawn downwards or upwards, and the two layers of cellular tissue being divided with the handle of the knife, the artery now appears close to the trunk of the external carotid artery, from which it is given off. In front of the artery passes the lingual vein; often, also, on its inner and outer side the facial vein; and still farther, the superior laryngeal nerve. The nerve must be drawn down, the vein up, and the artery tied from below upwards, immediately above the great horn of the tongue-bone. If the artery is to be tied still more distant from its origin, it is not necessary to cut into the fleshy fibres of the hypoglossal muscle. The artery otherwise runs through sufficient extent before it passes under any muscle.

1445. The *external maxillary or fascial artery is tied* at the angle of the lower jaw in the following manner. A cut is to be made on the inner edge of the masseter muscle, running obliquely downwards and outwards to the extent of an inch or a little more through the skin, the cellular tissue, and fibres of the *m. platysma myoides*. In this direction the cellular tissue and some threads of the facial nerve are cut through; and the edges of the wound being separated, the artery appears on the inner edge of the masseter muscle, lying on the *periostæum;* and close to it, on the outer side, is the facial vein; these are drawn outwards, and the artery isolated with ease.

This artery can be tied in its submaxillary part only with the greatest difficulty. Manec (*b*) declares himself against this operation, because the artery lies very deeply, and is covered by very many parts. Velpeau and Dietrich have given the modes of proceeding in this operation. By the former, an incision is made from the submaxillary gland to the inner edge of the sterno-mastoid muscle, and then a second from the hinder end of the great horn of the tongue-bone to the inner edge of the masseter muscle, through the skin and *m. platysma myoides*, and the flap so formed should be turned back upwards. The edges of the wound are to be kept asunder, the flap held up, and the now displayed *aponeurosis*, from which the artery is only separated by cellular tissue, must be cut through, in doing which the facial vein is sometimes divided, between the submaxillary gland and digastric muscle; after this the artery is to be isolated and tied between the great horn of the tongue-bone and the submaxillary gland. According to Dietrich, the cut should be made two lines from the

(*a*) Above cited. (*b*) Above cited, pl. iv.

under edge of the jaw, directly down, rather obliquely outwards and downwards, to the inner edge of the sterno-mastoid muscle. The facial vein is never to be cut through, but separated from the submaxillary gland, and carried outwards or inwards, as may be most convenient. The hypoglossal nerve is to be taken care of. The artery passes under the stylo-hyoid muscle, at the point where it is perforated by the digastric muscle, about half an inch from its insertion in the tongue-bone. The muscles together with the nerves, are to be separated from the cellular tissue, and carried downwards, and the ligature passed around the vessel from without inwards, and from below upwards.

1446. *Aneurysms of the temporal artery*, occurring after wounds, may be often cured by compression, as I have seen in one instance, when aneurysm occurred after arteriotomy; if this be not possible, the temporal artery must be tied. The position of the artery is to be first well ascertained by feeling with the finger, and then along its course a cut an inch in length is to be made through the skin, midway between the joint of the jaw and the auditory passage; a director is then to be introduced beneath the pretty thick cellular tissue by which the artery is covered, and this being divided the artery is to be isolated. The accompanying vein lies to the outer side.

1447. *Aneurysms of the occipital artery* rarely occur, though MEYER (*a*) mentions a case in which, on account of aneurysm, many branches and the trunk of the occipital artery were tied. J. BURNS (*b*) also tied this vessel for an aneurysmal swelling. A cut is to be made half an inch behind and a little beneath, the tip of the mastoid process, and continued obliquely upwards and backwards, to the extent of an inch or an inch and a quarter. The skin and *aponeurosis* of the sterno-mastoid muscle are to be divided, and the finger carried under the upper lip of the wound, in order to feel the base of the mastoid process. The *m. splenius* is then to be divided the whole length of the wound, and the pulsation of the artery being felt, should be carefully isolated, so as not to injury the accompanying veins.

1448. *To tie the posterior aural artery*, a cut half an inch long should be made from the lobe of the ear to the inner edge of the sterno-mastoid muscle, and continued upwards along its inner edge an inch upwards; this cut divides the skin, fatty cellular tissue, and the muscular *aponeurosis*. An assistant with a blunt hook separates the edges of the wound, and then is seen at the lower angle of the wound, a portion of the parotid gland; but in the upper angle, the lower edge of the lower retractor of the auricle; in the middle of the wound the artery is to be sought for, isolated and tied (*c*).

SYME (*d*) tied a branch of the posterior aural on account of aneurysm.

[ASTLEY COOPER (*e*) had a case of "aneurism of the posterior aural artery from a blow; he opened the sac, and was compelled to tie not only the vessel which led into the sac, but numerous others entering in all parts of the circumference of the swelling." (p. 82.)

BEGIN (*f*) gives the account of an aneurysm of the middle meningeal artery, in which the bone having been absorbed, the tumour became superficial, and, being

(*a*) Dissert. de aneurysmate arteriæ occipitalis, 1804.—SCARPA, Translation, p. 199. note.

(*b*) In his brother's Surgical Anatomy of the Head and Neck, p. 374.—MANEC, above cited, pl. v.—DIETRICH, above cited, p. 209.

(*c*) DIETRICH, above cited, p. 211.

(*d*) Edinburgh Med. and Surg. Journ., vol. xxxi. p. 66. 1829.

(*e*) Surgical Lectures.

(*f*) Dictionnaire de Médecine et de Chirurgie partiques, vol. ii. p. 533—article, *Anévrysme*.

mistaken for an encysted tumour, was extirpated. An ineffectual attempt was made to stop the bleeding by plugging; but the patient could not be saved.

The branches of the internal carotid artery within the skull sometimes become aneurysmal. A remarkable instance of this kind occurred to Dr. (afterwards Sir Gilbert Blane) (*a*), in a female of sixty-four years old, who "was suddenly seized with a fit of giddiness and dimness of sight, succeeded by acute pain in the forehead which remained for some time. The indistinctness of vision continued for six months; after this, she was at intervals seized with giddiness, headache, and imperfect vision. She had a similar attack two years after the first, from which also she recovered to a certain degree. From this period she continued subject from time to time, to the above-mentioned symptoms as long as she lived. She for some time saw objects double, but the particular period of this could not be ascertained." (pp. 193, 94.) She afterwards betrayed signs of mental derangement, and became maniacal, and died in that state five years after her first attack. On *examination* there was found more water than usual in the ventricles of the brain; upon the *falx* some *spicula* of bone; and the optic nerves were smaller than usual, as if they had been wasted. "The morbid appearance in this case, which was so singular, and to which the symptoms of complaint seemed chiefly referable, was to bulbs about five-eighths of an inch in diameter, filling up the hollow on each side of the *sella tursica*, which were evidently dilatations of the carotid arteries, and, from their being filled with *laminæ* of coagulated blood, there could be no doubt of their being aneurisms of these arteries. The one on the left side was the largest; that on the right communicated with the cavity of the artery, which was not the case with the other." Blane observes:—"It is probable that one of the aneurisms arose five years before her death, occasioning the first attack described, and that the other arose two years afterwards, occasioning the other attack. It is also probable that it was between these two attacks that she saw objects double, from the unequal compression on the optic nerves." (pp. 196, 97.) Hodgson mentions an instance of a small aneurysm in the anterior cerebral artery, filled with a solid coagulum, and another in the basilar artery was seen by Serres.]

II.—OF ANEURYSMS OF THE SUBCLAVIAN AND AXILLARY ARTERIES.

1449. Aneurysm of the axillary artery in general increases quickly, as the surrounding parts offer little opposition. The swelling raises the great pectoral muscle, spreads towards the collar-bone, and thrusts it upwards. It is, therefore, rarely that this aneurysm is so early observed, that there is still space sufficient (*b*) for tying the axillary artery, and this operation is usually possible only in aneurysms at the upper part of the brachial artery.

1450. *Tying the axillary artery* may be performed in two situations, namely, *first*, by cutting through the great pectoral muscle, under the collar-bone; and *second*, by division of the tendinous interspace between the pectoral and deltoid muscles. The patient either lies on a bed or sits on a sloping chair, with the shoulders somewhat depressed; an assistant stands behind, and is ready to compress the subclavian artery, if bleeding should occur during the operation.

1451. In the *first mode* of operating, a cut must be made through the skin, commencing an inch from the sternal end of the collar-bone, and continued along its under edge towards the coracoid process of the blade-

(*a*) History of some cases of Disease in the Brain; in Trans. of a Society for the Improvement of Med. and Chir. Knowledge, vol. ii. 8vo. 1800.

(*b*) Keate; in London Medical Review, 1801.—Pelletan, Clinique Chirurgicale, vol. ii. p. 49.—Chamberlaine, Medico-Chir. Trans., vol. vi. p. 128.

bone, as far as the cleft which separates the pectoral and deltoid muscles. In this direction the connexions of the great pectoral muscle with the collar-bone are divided, and thus the lessor pectoral muscle is exposed, which, beginning from the coracoid process, crosses the lower angle of the cut. The point of the finger is then to be introduced between the coracoid process and the lower edge of the collar-bone, and the artery is there found surrounded, upon the outer side, and partially covered by the brachial *plexus*, and upon the inner side by the brachial vein. The artery is now to be carefully separated from the vein and nerves, and a single ligature carried round it with DESCHAMPS' needle, before withdrawing which, the artery should be compressed upon it, for the purpose of ascertaining that it alone is taken hold of. The small arteries wounded during the operation are to be tied at once, and the wound kept clear of blood. The dressing and after-treatment are to be conducted according to the former general rules.

The direction of the wound in this mode of operation is variously advised. The most important variations are—that recommended by LISFRANC, in which the cut is commenced half an inch from the sternal end of the collar-bone, in the pit formed by the clavicular and sternal parts of the great pectoral muscle, and carried three inches below the collar-bone; and the practice recommended by ZANG and others, who carry the cut close beneath the collar-bone, beginning from its middle, and continue it for two and a half inches downwards and outwards, nearly to the coracoid process.

1452. In the *second mode* of treatment, if the artery be not tied so near the collar-bone, a cut is made of two and a half inches in length, from the lower edge of the outer third of the collar bone, towards the inside of the upper arm, on the interspace between the great pectoral and deltoid muscles. The lesser pectoral muscle is cut off at its insertion to the shoulder-blade. The forefinger is now to be carried deeply into the wound, and passed upon the surface of the *m. serratus magnus*, till its tip reach the shoulder-blade. The finger is now curved, and, following the inner surface of the subscapular muscle, is again carried forwards, up to the outer lip of the wound in the skin. In this way is the whole armpit swept round, and the entire mass of vessels and nerves, collected immediately under the collar-bone, are without difficulty brought to the external parts between the edges of the wound, and fixed with the finger. Here the artery is easily isolated and tied (*a*).

[The operation of tying the axillary artery in either mode above recommended, or indeed in any other way, has not met with much favour among practical surgeons; the position of the vein so much in front of it, and its almost complete envelopment by the axillary nerves, together with its great depth, render it a very hazardous and difficult operation. As to dragging up the whole mass of vessels and nerves to the surface, and then selecting the artery to be tied, as recommended by DELPECH, no person who had had any experience in tying arteries, would think of doing, on account of the necessary detachment of the vessel from its connexions, which would put it into a very unfavourable condition for the effusion of adhesive matter on its exterior, and interfere with its healing up. And indeed, though this might be done on a vessel undiseased, yet if any aneurysmal swelling existed, there would not be room to attempt it. Nor is there any good reason to perform so troublesome and dangerous an operation, when tying the subclavian above the collar-bone will answer all the purposes required, with greater ease and safety. If the artery were wounded and its ends exposed, as in HALL's case, related by J. BELL (*b*), and MAUNOIR's case men-

(*a*) DELPECH, Chirurgie Clinique de Montpellier, vol. i.

(*b*) A Discourse on the Nature and Cure of Wounds. Third Edit., Edinburgh, 1812, p. 59.

tioned by Scarpa (*a*), then tying the ends of the wounded vessel would, as under ordinary circumstances, be required. But for aneurysm of this vessel, tying the subclavian is always preferable.—J. F. S.]

1453. If an aneurysm situated upon the commencement of the axillary artery, or at a deep part of its commencement, so extend, that it reach the collar-bone, the *subclavian artery must be tied above the collar-bone.* The patient being seated on a chair, or laid horizontally upon a table, and the shoulder of the ailing side depressed as much as possible, a cut is made through the skin, extending from the outer edge of the sterno-mastoid muscle, along the collar-bone, to the clavicular insertion of the *m. trapezius.* Then the *m. platysma myoides* is to be divided carefully in the same direction, so that the external jugular vein may not be wounded, which, when laid bare, is to be drawn towards the shoulder with a blunt hook. The cellular tissue in the midst of the wound is next divided with the knife, or more safely with the finger, or a director, till the edge of the *m. scalenus anticus* be reached with the finger, where the artery is found lying on the first rib, and the ligature is to be carried round it with Deschamps' or Desault's needle.

The cut for tying the subclavian artery, should, according to Zang, be made in the middle of the triangle, formed by the hind belly of the *m. omo-hyoideus*, and the hind edge of the clavicular part of the *m. sterno-cleido-mastoideus*, and should be commenced two inches above the collar-bone, at the hind edge of the latter muscle, and carried somewhat obliquely outwards and downwards to the middle of the collar-bone.

I have found this operation easiest on the dead subject; the subclavian vein lies on the inside of the artery, the nervous *plexus* on the outside, and partially covering it. A little stud on the first rib, which is felt at the inner side of the artery, and the hollow made by the artery in that rib, are given as the certain marks for directing the finger upon the artery. Taking up this artery is often extraordinarily difficult, and even impossible (*b*), if, from the size of the swelling, the collar-bone be very much thrust up; the operation should therefore always be performed early. The same also happens in tying the ligature for which Liston (*c*) has proposed a peculiar contrivance. As the artery is partially covered with the *plexus* of nerves, one of the nerves may be taken up and tied instead of the artery, as pulsation is propagated to it (*d*).

In one case where the ordinary mode of treatment was inapplicable, Dupuytren (*e*) cut through the *m. scalenus anticus.* Hodgson, Lisfranc, and Graefe, have proposed the same in their modes of practice, that, after a long cut has been made through the skin and the *m. platysma myoides*, from the hind edge of the sterno-mastoid muscle, from two to two and a half inches along the collar-bone, the operator should dip deeply, and seek for the *m. scalenus anticus*, pass beneath it a curved director, raise it up and cut it through either from without inwards, or carefully across, without previously introducing a director.

[The operation of tying the subclavian artery above the collar-bone was first attempted by Astley Cooper in the spring of 1809, but "the aneurysm was very large, and the clavicle was thrust upwards by the tumour, so as to make it impossible to pass a ligature under the artery, without incurring the risk of including some of the nerves of the axillary *plexus.* The attempt was therefore abandoned" (*f*).

(*a*) Wishart's Translation, above cited, p. 412.

(*b*) Cooper, A., London Medical Review, vol. ii. p. 300.

(*c*) Edinburgh Medic. and Surg. Journal, vol. xvi. p. 348.—Langenbeck, in his Neuer Bibliothek für Chirurgie und Ophthalmlogoie, vol. iii. p. 269, pl. i. f. 2, pl. ii. f. i.

(*d*) Manec, above cited. pl. iv.

(*e*) Leçons Orales, vol iv. p. 530.

(*f*) London Medical Review, vol. ii. p. 300.

The operation was first performed in St. Bartholomew's Hospital, *Nov.* 2, 1809, by Ramsden (*a*), for axillary aneurysm about half the size of a large orange. He first made a transverse cut through the skin upon the collar-bone, two and a half inches long, from the outer border of the *m. trapezius*, to within half an inch of the outer edge of the *m. sterno-mastoideus*; and then pinching up the skin above the bone, he divided it, from within, outwards and upwards, in the line of the outer edge of the sterno-mastoid muscle to the extent of two inches. His object in pinching up the skin for the second cut "was to expose at once the superficial veins, and by dissecting them carefully from the cellular membrane, to place them out of the way without wounding them." (p. 282.) He then dissected with his knife till he had brought into sight "the anterior *scalenus* muscle immediately below the angle which is formed by the traversing belly of the *m. omo-hyoideus*, and the edge of the *m. sterno-cleido-mastoideus*; and having placed his finger on the artery, at the point where it presents itself between the *scaleni*, he found no difficulty in tracing it without touching any of the nerves, to the lower edge of the upper rib, at which part he detached it with his finger-nail for the purpose of applying the ligature." (p. 283.) Various kinds of instruments, fixed in handles, were essayed in vain to pass the ligature, which was at last managed with a flexible probe, the end of which being introduced behind the artery, was drawn out with the forceps, and the operation completed with a single ligature. The patient died after five days. The subclavian artery was next tied by Sir William Blizard, in 1811, in the London Hospital, but the patient died on the fourth day; by Thomas Blizard, in 1815, but death followed on the eighth day (*b*); in the same year, by Dr. Colles, of Dublin, but the man died on the eighth day (*c*). The first successful case was that of Dr. Post, of New York, who operated on *Sept.* 8, 1817; the aneurysmal tumour burst on the *ninth* day, and discharged above three ounces of blood; the ligature came away on the *eighteenth* day (*d*). The second successful case was Liston's, in which the operation was performed on *April* 3, 1820; the ligature came away on the twelfth day (*e*). Since this time favourable results have frequently followed ligature of the artery at this part, by English surgeons, Gibbs of St. Petersburg, Bullen of Lynn, Wishart of Edinburgh, Green at St. Thomas's, twice, Key and Bransby Cooper, each at Guy's Hospital, and Hobart of Cork.

Green, in his operations, made a similar cut above the collar-bone, with its concavity upwards, and the inner end higher than the outer; and, in the case referred to at *page* 498, the external jugular vein being in the way, he put two ligatures upon it, about an inch above the collar-bone, and divided between them, which gave much additional room. To avoid the difficulty often experienced in passing the ligature round the artery, instead of using the common aneurysmal needle, either with or without a handle, and which difficulty appears to arise from the too great length of the curve of the needle, he employed a needle, the curve of which, in size and shape, nearly resembled an ordinary button-hook, and with this the ligature was readily passed round the vessel.

In taking up the artery care should be taken that the ligature be not passed round one of the nerves instead of the artery: this mistake occurred to both Liston and Green, but was quickly discovered and corrected. An occurrence like this happening to such able and excellent surgeons will show the necessity of extreme caution before tightening the ligature. I recollect also having seen, on one occasion, the posterior scapular artery, as it crossed the space between the sterno-mastoid and trapezial muscles, being mistaken for the subclavian, and tied, but this mistake was quickly discovered, and the subclavian immediately found and tied.—J. F. S.]

[For a table showing the mortality following the operation of tying the subclavian artery, see Norris (*f*).—G. W. N.]

1454. If the aneurysm be situated in the subclavian artery itself, *tying that artery on the tracheal side of the m. scalenus* may, perhaps, give hope

(*a*) Practical Observations on the Sclerocele, &c.; to which are added four Cases of Operation for Aneurisms. Lond., 1811. 8vo.

(*b*) Hodgson, above cited, p. 596.

(*c*) Edin. Med. and Surg. Journ., vol. xi. p. 1.

(*d*) Med. Chir. Trans., vol. ix. p. 185.

(*e*) Edinb. Med. and Surg. Journ., vol. xvi. p. 348.

(*f*) Amer. Journ. of the Med. Sciences, vol. x. p. 13. 1845.

of a cure. This operation must, however, always be considered as extremely dangerous and hazardous, if it be remembered with what important structures the artery is connected. The pneumo-gastric and phrenic nerves lie before it, the lower cervical ganglion and sympathetic nerves behind it; on the right side, the recurrent laryngeal runs round it, and upon the left, lies between it and the gullet; the subclavian vein lies immediately beneath the collar-bone before the artery, and when distended, even upon it; and it rests immediately upon the *pleura*, which, in carrying round the needle, may be easily wounded. If the ligature be applied in the neighbourhood of the origin of the inferior thyroideal, internal mammary, and vertebral artery, the formation of a plug is prevented, and secondary bleeding ensues (*a*). It is also to be farther remembered, that aneurysm of the *aorta*, or of the *arteria innominata*, frequently rises so much above the collar-bone (1), that it may be easily mistaken for subclavian aneurysm (*b*). A. Cooper, Colles, Arendt, Mott, and Hayden, have performed this operation, but not successfully in any case.

The proceeding in this operation is as follows:—A cut three inches in length is to be made through the skin, and *m. platysma myoides*, immediately above the sternal end of the collar-bone; a director should be passed under the clavicular origin of the sterno-mastoid muscle, which is to be divided from the bone, or according to Hodgson and Arendt, the sternal origin also. The cellular tissue is then to be divided with the finger, or with the handle of a knife, till the tracheal edge of the *m. scalenus anticus* is reached, behind which the artery is felt passing. It will be advisable to draw the artery forth, so that the ligature may be applied beneath the origin of the inferior thyroideal and vertebral arteries. When the artery is surrounded by the aneurysmal needle, very great care must be taken not to wound the *pleura*, nor to include any other structure.

Dietrich (*c*) has proposed a modification of King's operation for the right and left side. Upon the *right* side a cut is to be made from the middle of the semi-lunar notch in the top of the breast-bone upwards, directly in the middle line of the windpipe. He then penetrates, in the same way as he proceeds in tying the *arteria innominata*, into the interspace between the two sterno-hyoideal muscles, till he comes to the bifurcation of the subclavian artery. The sterno-hyoideal and sterno-thyroideal arteries are now to be drawn outwards with a blunt hook, and the sheath of the artery carefully slit up, till the pneumo-gastric nerve and internal jugular vein be seen descending immediately before the artery. Upon the *left* side, a cut is to be made on the inner edge of the sterno-mastoid muscle, a line from it, nearer the windpipe, which shall extend for two and a half inches up, along its inner edge, but so, that it is always a line's breadth distant from it. A transverse cut of half an inch, is then to divide the skin and sterno-mastoid muscle. The cellular tissue in the wound is to be carefully divided, any irregular vein, if cut through, to be tied, and the divided sternal portion of the sterno-mastoid muscle drawn towards the left shoulder, with a blunt hook, by an assistant. The outer edge of the sterno-thyroid muscle now appearing, the cellular tissue connecting the underlying parts is now to be somewhat loosened, and drawn by an assistant towards the right side. The carotid artery then appears in the wound, the internal jugular vein in its outer side, and the pneumo-gastric nerve between them. In the lower part of the wound, opposite the base of the breast-bone, behind, and to the outer side of the carotid, lies the subclavian artery. The internal jugular vein is now to be carefully separated from the

(*a*) Hodgson, above cited, p. 381.
(*b*) Burns, A., above cited, p. 30. (*c*) Above cited, p. 43.

pneumo-gastric nerve and carotid artery, and drawn back with a blunt hook towards the shoulder by an assistant, who also draws the sternal portion of the muscle in the same direction. The subclavian artery, enclosed in its thick cellular sheath, now becomes visible; its branches, the inferior thyroideal, transverse cervical, vertebral, and internal mammary, are given off somewhat above. The thoracic duct, which here forms its curvature, lies on the inner edge of the sheath of the artery, and also behind the carotid. The artery is now to be somewhat isolated with the handle of the scalpel, the sheath opened on the outside with a careful stroke of the knife, by which injury of the thoracic duct is best avoided, and then with a curved blunt hook the ligature should be carried round the artery from behind forwards, and from above downwards.

[(1) In reference to this most important point it may be mentioned, that there are in the Museum at St. Thomas's Hospital two preparations. The one, an aneurysm of the arch of the *aorta*, involving part of the *arteria innominata*, and mistaken for carotid aneurism; a parallel instance to ALLAN BURN's case. The other, an aneurysm from the curvature between the origins of the left carotid and subclavian arteries, which communicated by a narrow canal with a large bag in the neck, and having the carotid artery behind it. The latter was the case to which ASTLEY COOPER referred, when advising BURNS to be cautious in undertaking a proposed operation for a pulsating tumour above the clavicle, which was at first thought to be a subclavian aneurysm. In the Museum at Fort Pitt, Chatham, there is a preparation of an aneurysm as large as a walnut between the origins of the *arteria innominata* and left carotid. And also another, bounded by the brachio-cephalic trunks in front, the sac of which is deeply indented by the *arteria innominata*.—J. F. S.]

1455. ALLAN BURNS (*a*) and HODGSON (1) proposed *tying the arteria innominata*, and showed, by injecting the dead body, that the circulation can be supported after the obliteration, and that on the subject, the operation can be performed without great difficulty, if the head be bent back, the sternal portion of the sterno-mastoid, sterno-thyroid and hyoid muscles be separated, and the artery followed to its origin. MOTT (*b*), GRAEFE (*c*), ARENDT (*d*), HALL (*e*), BUJALSKY, BLAND, and LIZARS (*f*), have performed this operation on the living subject, but not successfully.

In MOTT's case, the patient died on the twenty-sixth day, in GRAEFE's, on the sixty-seventh, and in ARENDT's, on the eight day; in the two former cases from repeated bleeding, and in the third, in consequence of severe inflammation of the aneurysmal sac, of the *pleura*, and lung. MOTT, beginning from the aneurysmal swelling, made a cut above the collar-bone, lengthened it to that bone, and continued it on the windpipe, above the upper end of the breast-bone. From thence he made a second cut of about the same length, and carried it along the inner edge of the sterno-mastoid muscle. He then separated the skin from the *m. platysma myoides* beneath it, cut through the latter, and carefully separated the sternal part of the sterno-mastoid muscle in the direction of the former cut. The internal jugular vein, which had adhered to the swelling, was now separated, the sterno-hyoid, sterno-thyroid muscles cut through, and turned back over the air-tube. The carotid now laid bare for some lines above the breast-bone, was separated from the pneumo-gastric nerve, and the internal jugular vein,

(*a*) BURNS, above cited, p. 31.

(*b*) Medic. and Surg. Register of New York, 1818, vol. i. p. 8.—von GRAEFE und von WALTHER's Journal, vol. iii. pt. iv. p. 569.

(*c*) Journal above cited, and vol. iv. pt. iv. p. 587.

(*d*) Vermischte Abhandlungen aus dem Gebiete der Heilkunde von einer Gesellschaft praktischen Aerzte zu St. Petersburg. Samuel, iv. 1830, p. 188.

(*e*) Baltimore Medic. and Surg. Journal and Review. Oct. 1833, p. 133.

(*f*) Lancet, 1836–7, vol. ii. p. 445, p. 602.

which were drawn to the outer side. He now exposed the subclavian artery, in which he particularly used the handle of the scalpel, and a small narrow knife, with a rounded cutting end. In this way he penetrated to the division of the *arteria innominata*, following it under the breast-bone, freed it with the handle of the knife from all the surrounding cellular tissue, and after drawing the recurrent and phrenic nerve aside, he applied a round silk thread around the artery, about half an inch above its division.

Graefe makes an incision on the inner edge of the sterno-mastoid muscle two inches long, and continues it two inches downwards upon the first portion of the breast-bone. He then separates the lips of the wound with blunt hooks, and passes the fore-finger of his left hand, between the sternal part of the sterno-mastoid and sterno-hyoid muscles, not farther than the top of the breast-bone, separating the cellular tissue up to the carotid artery. The patient's head is to be then bent much backwards by an assistant, and the operator carries his finger down along the carotid. Having reached the inner surface of the top of the breast-bone, he finds a blue swelling, under which his finger must be introduced. With the aid of his finger, and the handle of the scapel, he proceeds down to the place where the *arteria innominata* divides into the carotid and subclavian arteries. Then continues for half an inch farther down, takes the hook, armed with a thread, in the right hand, passes it close to the finger of the left hand, down to the *arteria innominata*, and carrying it around it, draws the threads, and applies Graefe's ligature-apparatus.

Mott used the instruments employed by Parrish, Hartshorne, and Hewson (*a*), which he recommends as sufficient for tying deep arteries. He carries a blunt-ended needle, having two eyes at the two ends, with a needle-holder, around the artery, carefully avoids the *pleura*, then introduces a hook into the eye of the needle, which is brought into view, with which, after freeing the needle-holder, he draws the needle out, and with it the ligature, which is then to to be gradually drawn together and tied with two single knots. No effect upon the heart or lungs was noticed.

[(1) Chelius is mistaken as regards Hodgson on this point, for he neither proposed nor advised this operation. He merely quotes the operation proposed by Burns, and as to his opinion of it he observes:—"The ligature of the *arteria innominata*, or of the subclavian artery, on the tracheal side of the *scalenus*, must be regarded as peculiarly hazardous. I have thought it proper, however, to treat of these operations, because, under particular circumstances, a surgeon may conceive it his duty to undertake them." (p. 384.)—J. F. S.]

1456. Besides these operations performed on living subjects, Bujalsky, King, Dietrich, and Manec, have proposed other methods for tying the *arteria innominata*.

According to Bujalsky, the cut through the skin should be made on the inner edge of the sternal portion of the sterno-mastoid muscle, between it and the windpipe, as long as the breadth of four fingers, a little to the inner sider of the muscle above, commencing at the middle of the neck, and extending down to the middle of the notch of the breast-bone. The fibres of the *m. platysma myoides* are now apparent at the upper angle of the wound, but at the lower, there is a considerable quantity of fat. The cut is to be continued deeper, and in the middle of the wound the sterno-hyoid muscle is exposed, and to be cut

(*a*) Eclect. Repos., vol. iii. p. 229.

through obliquely; beneath it is the sterno-thyroid muscle, which is also to be divided. The operator should keep as much as possible to the inner edge, because the internal jugular vein runs along the outer edge. The inferior thyroideal vein, which in the wound passes obliquely under the muscles, is to be drawn upwards or downwards. Sufficient depth having now been attained, the artery is to be isolated and tied.

In King's (or, rather, O'Connell's) mode, a cut from fifteen to eighteen lines long is to be made on the inner edge of the sterno-mastoid muscle of the *left side*, through the skin, *m. platysma myoides* and *fascia* of the neck; the finger is then passed between the sterno-thyroid muscles, and under the right of those muscles, the cervical *fascia* divided, the finger introduced beneath it, and carried down to the *arteria innominata*, lying upon it.

Dietrich has correctly shown the impracticability of King's operation, and proposes the following:—The patient's head should be bent a little backwards, and a cut from two and a half to three inches long, according as the neck is longer or shorter, and more or less fat, should be made from the middle of the base of the breast-bone directly upwards, in the mesial line of the windpipe. After dividing the cellular tissue and *fascia*, several little veins appear, enclosed in loose cellular covering; these may very easily be put aside, as they run in the same direction as the windpipe, and terminate in a large vein, which is visible at the lower angle of the wound. The cellular tissue is to be removed, and now the internal cervical *fascia* appears; on both sides lie the sterno-hyoideal muscles, separated by an interspace of two or three lines, and the *fascia* occupying it being cut through, the windpipe is reached. With a blunt hook the right sterno-hyoid, and sterno-thyroid muscles, are to be drawn outwards, which exposes the second inferior thyroideal vein, in the bottom of the wound, sometimes considerably expanded. If it be of the usual size, the point of the scalpel should be carried on its outer side, and the fatty cellular tissue carefully divided, the handle of the scalpel carried downwards, and so the *arteria innominata* reached. But if this vein be considerably enlarged, it must be got under from within outwards, and the cellular tissue in that way divided; this, however, must only be done with the handle of the knife, as otherwise there is no safety against wounding it, which is here of the greatest importance, as this vessel empties itself into the *vena cava descendens*, and, if wounded, severe bleeding would occur from the reflux of the blood. The hook is to be carried under the artery from left to right.

Manec (*a*) directs the head of the patient to be bent much backwards, so that the neck shall be greatly stretched, and the vessel to be tied brought up to the upper edge of the breast-bone; and the face is to be inclined a little towards the left shoulder. A cut of three inches' length is to be made from the middle of the space dividing the two sterno-mastoid muscles, towards the right shoulder, half an inch above the collar-bone, through the skin and *m. platysma myoides;* in the same direction the sterno-mastoid muscle is to be divided, and a director having been

(*a*) Above cited, pl. ii.

passed under the sterno-hyoid and sterno-thyroid muscles, they also are to be divided. For isolating the artery, the operator uses only the handle of the knife. If the inferior thyroideal vein, and some fibres of the hypoglossal and first cervical nerve require division, this must be done with the knife. The artery is to be isolated at its outer and back part with great care, so as not to injure the *pleura*. After this is done, Deschamps' needle should be introduced from the outside, between the pneumo-gastric nerve and the *pleura*, carried out upon the other side between the artery and the windpipe, and the ligature then drawn in.

1457. When the entire trunk of the subclavian artery is obliterated, the blood flows from the superior thyroideal and occipital arteries, into the inferior thyroideal, cervical, transverse scapular, and numerous anastomoses, which spread over the neck and shoulder, into the subscapular, supra-scapular, and posterior-scapular arteries, from which it passes into the trunk of the brachial artery. If the obliteration be at the lower end of the subclavian, or at the axillary artery, the passage of the blood is much more ready, as it is carried by the anastomoses of the cervical, transverse cervical, and transverse scapular arteries, with the branches of the subscapular and posterior-scapular into the brachial artery (1). That in many cases, after tying the axillary artery for a wound, the sensation and nourishment of the arm are injured, depends not on the too small flow of blood, but on the injury of the *plexus* of nerves, caused by the wound, or by the tying (2).

(1) The following is the account of the mode in which the circulation was maintained in a case of axillary aneurysm, for which Key had tied the subclavian artery twelve years previously (*a*); the circumstances of which had been already described (*b*). "The subclavian trunk had undergone no material alteration in size from its origin to the point where the ligature had been applied, just on the outer edge of the *scalenus* muscle. Here the vessel became suddenly obliterated, assuming the form of a dense flattened cord, which was continued for about two inches and a half into the *axilla*, and terminated in the remains of the aneurismal sac. The precise spot where the artery had been tied was clearly indicated by a deep indentation; but the continuity of the vessel above the ligature with the obliterated portion below it, was not destroyed, or, more, properly speaking, had been restored, after the separation of the silk, by a process of adhesion, which connected the two extremities to each other, and glued them to the contiguous structures. The aneurismal sac still existed in the *axilla*, where it formed a firm and solid, but at the same time somewhat elastic and yielding tumour about the size of a small hen's egg. * * * and presented a smooth uniform exterior, bearing altogether considerable resemblance to those cysts which are occasionally found to form themselves around foreign bodies. The obliterated portion of the axillary trunk terminated in the upper and back part of the sac; while, from its under surface, the continuation of the artery was seen to emerge as a perfect vessel; having been restored to nearly its natural calibre by the entrance of a large branch, which was originally given off immediately below the tumour, and through which the blood had afterwards assumed a retrograde course. On opening the sac, the coats of which were remarkably dense and hard, it was found to contain a firm and solid coagulum, which readily separated from the surrounding cyst, and on being removed, retained the precise shape of the tumour. A section of it clearly evinced that it consisted of fibrin, apparently inorganized, dense and tough in its texture, and of a dirty-yellowish colour." The anastomosing vessels consisted of three sets:—"1. A posterior set, consisting of the suprascapular and posterior scapular branches of the subclavian, which anastomosed with the infrascapular from the axillary. 2. An internal set, produced by the connexion of the internal mammary on the one hand, with the long thoracic arteries and the infrascapular on the other. 3. A middle or axillary set, which consisted of a number of

(*a*) Guy's Hospital Reports, vol. i. 1836. (*b*) Med. Chir. Trans., vol. xiii. p. l. 1827.

small vessels derived from branches of the subclavian above, and passing through the *axilla* to terminate either in the main trunk, or some of the branches of the axillary below. This last set presented, most conspicuously, the peculiar character of newly-formed, or rather dilated, arteries. They were excessively tortuous and formed a complete *plexus*, which was almost inseparably connected with the axillary nerves; many of the branches penetrating into the midst of the nervous fibres, so as to render their separation a work of great difficulty and labour. The chief agent in the restoration of the axillary trunk below the tumour was the infrascapular artery, which communicated most freely with the internal mammary, suprascapular, and posterior scapular branches of the subclavian; from all of which it received so great an influx of blood, as to dilate it to three times its natural size. The infrascapular artery was, in this subject, given off much higher than usual; and its origin had been included in the aneurysmal dilatation; in fact the artery opened into the sac itself; and, under the restored state of the circulation, the blood had to traverse a small portion of the cavity in order to reach the commencement of the axillary trunk. The continuity between the two vessels had been preserved through the *coagulum* contained in the tumour, which, for a short space, actually constituted the arterial coats; thus, when the contents were removed, the injected wax became exposed at the bottom of the cyst; while a corresponding deep *sulcus* in the *coagulum* indicated the channel through which the blood had passed. The suprascapular artery was, in this instance, given off by the superficial cervical, and became augmented just as it reached the *scapula*, by a branch which arose from the obliterated portion of the main trunk, but which had again been rendered available, as a medium of circulation, by receiving a vessel from the subclavian above. The common origin of the short thoracic and humeral-thoracic arteries had become obliterated as it came off from the sac itself; but the two vessels had subsequently regained their original size; the one being supplied by its connexion with the internal mammary, the other by communications with the superficial cervical." (p. 63–5.)] This preparation is in Guy's Hospital Museum.

(2) Not only do weakness and numbness occur when the axillary nerves are injured, but even gangrene has happened in the case mentioned by WHITE, of Manchester (*a*), in which three of the nerves were tied in, and in DESAULT'S case (*b*), in which the whole axillary *plexus* was included in the ligature.—J. F. S.]

1458. The tying of two branches of the subclavian artery, to wit, the internal mammary, and the vertebral artery have yet to be mentioned.

1459. The *internal mammary artery may be tied* without much difficulty in the second, third, or fourth intercostal space; in the first, its nearer position to the edge of the breast-bone renders its tying more difficult. In either of the just-named intercostal spaces, a cut made from the edge of the breast-bone, and on the upper edge of the lower rib, is carried outwards, and a little upwards towards the lower edge of the upper rib, so that its whole extent occupies an inch and a half, and by its termination, just below the under edge of the upper rib, it is secured from injuring the intercostal artery. The skin, cellular tissue, and *aponeurosis* of the great pectoral muscle are divided, and also the muscle itself. There still appear some layers of cellular tissue, and beneath them the *ligamenta nitentia;* these are to be divided with some slight strokes of the knife, as well also as some fibres of the intercostal muscles hereupon seen, with which usually a small arterial branch is cut through, and must be at once tied. A thin layer of cellular tissue still covering the artery is now to be carefully divided, the artery isolated from the accompanying vein, and a needle carried round it, from within outwards. In the third and fourth interspace the artery lies upon the fibrous expan-

(*a*) London Medical Journal, vol. iv. p. 159. (*b*) Œuvres Chirurgicales, vol. ii. p. 553.

sion of the *m. triangularis sterni;* so that, in carrying round the needle, there is no fear of wounding the *pleura* (*a*).

Velpeau's practice of making a cut three inches long, parallel to the side edge of the breast-bone, and which must be deepened to get at the artery, is unfitting. On the contrary, I have very frequently found the artery by a cut, commencing on the side edge of the breast-bone, and running directly in the middle of the costal interspace, more frequently than in the way just described.

1460. For the possible case of *tying the vertebral artery*, Dietrich (*b*) has proposed two modes of treatment, according as the artery is to be looked for between the *atlas* and dentate *vertebra*, or between the *atlas* and occipital bone.

In the *former* case, the head of the patient being inclined to the opposite side, and a little forwards, a cut is to be made two fingers' breadth from the lobe of the ear, or one finger, behind the mastoid process, beginning half an inch above the latter, and carried for two inches along the outer hinder edge of the sterno-mastoid muscle. From the upper fourth of the length of this cut, a second is to be carried backwards, and obliquely downwards, to the extent of an inch. After dividing the skin, some cellular tissue appears in both cuts, which should be divided, and then in the first is seen the outer and hinder edge of the sterno-mastoid muscle; and in the second, the *m. splenius* covered with aponeurotic expansion. The wound is now to be deepened, through the aponeurotic and cellular tissue, and in the second cut the fibres of the *m. splenius* are to be divided, at which time a small artery will be wounded. After the division of this muscle a second aponeurotic layer appears, which must be divided with some light strokes of the knife, and under it pass some branches of arteries and nerves. An assistant with blunt hooks holds the edges of the wound apart, and now a layer of fat appears, in which the vertebral artery is enveloped. At the same time also the outer edge of the *m. obliquus capitis inferior* is seen at the inner edge of the second wound, and is to be drawn somewhat inwards. Two branches of the occipital artery, also enclosed in cellular tissue, pass across the wound. The cellular tissue is now to be divided with the handle of the knife, and the arterial branches drawn upwards or downwards. Two branches of the second cervical nerve also now show themselves, and are to be drawn up or down out of their place; after which the isolation of the artery is no longer prevented. This done the needle is to be carried round the artery from without inwards, in order more certainly to avoid the internal carotid artery, which lies very near the vertebral, and is only separated from it by cellular membrane.

If the vertebral artery be tied between the *atlas* and *occiput*, the cut should be made, as in the former case; but the first is to be begun a quarter of an inch above the mastoid process, by which the second cut, which, in like manner, passes from the upper fourth of the length of the former backwards and obliquely downwards, runs somewhat more upwards. After cutting through the skin, *fascia*, and *m. splenius*, the occipital artery appears in the upper angle of the first wound, as also at the front edge on the upper fourth, the hind edge of the *m. obliquus capitis superior;* but in the whole surface of the wound a layer of *aponeurosis*, and under it cellular tissue, loaded with fat, the former of which

(*a*) Dietrich, above cited, p. 89. (*b*) Ibid., p. 81.

must be carefully divided. The edges of the wound are now to be held asunder with blunt hooks by an assistant, and then a triangle appears, formed by the *m. rectus capitis posterior*, and *m. obliquus capitis superior* and *inferior*, filled with fat and cellular tissue, which covers the artery. This is then to be carefully divided, turned back, and, if in large quantity, should be partially removed, upon which the artery appears below the *m. obliquus capitis superior*, and runs backwards nearly an inch before it perforates the occipito-atlantal ligament. The vessel is then to be isolated, and the ligature, by the aid of a ligature-needle, passed obliquely from below upwards, for the purpose of more surely avoiding the nerves and vein.

Nuntiante Ippolito, who saw two cases of aneurysm of the vertebral artery, has proposed the following mode of tying it. After having found the triangular space formed by the external jugular vein, the hind edge of the sterno-mastoid muscle, and the upper edge of the collar-bone, a cut is to be made through the skin, from its top to the base, not exceeding two inches in length. The operator continues penetrating in this direction till he reach the inner edge of the *m. scalenius anticus*, and thus the artery is easily struck upon, without injuring one twig of a nerve (*a*).

Möbus (*b*) mentions a case of aneurysm of the vertebral artery, originating in wound which was cured by compression, the application of ice, and so on.

[An example of this very rare disease (aneurysm of the vertebral artery) has recently occurred in the Northern Infirmary at Liverpool; the carotid artery could be distinctly traced over the pulsating swelling, of the actual nature of which there were some doubts, as to what kind of aneurysm it was, or whether only a pulsating tumour. It was decided to tie the common carotid artery. The tumour rapidly increased after the operation, and in about a fortnight the patient died by bursting of the aneurysm into the trachea. On *examination*, an aneurysm of the vertebral artery, between the transverse processes of the fourth and fifth cervical *vertebræ* was found.—J. F. S.]

Upon the importance of tying the vertebral arteries, and its greater danger in comparison with tying the carotid arteries in animals, see Astley Cooper (*c*).

[The arteries of the brain sometimes become affected with aneurysm. In the Museum of the Royal College of Surgeons, there is an example of a small conical aneurysm in the cerebral artery.—J. F. S.]

III.—OF ANEURYSM OF THE BRACHIAL, ULNAR, AND RADIAL ARTERIES.

1461. Aneurysms of the brachial artery, and its branches, are almost always consequent on wounds, and occur most frequently at the bend of the arm, after a wound of the artery in bleeding. In these aneurysms therefore compression is commonly employed with the best results.

["I do not recollect," says Astley Cooper, "to have seen a case of aneurysm from disease in the brachial artery." (p. 78.) Hodgson observes:—"I have never seen an aneurysm in the arm which was not produced by accidental violence." (p. 389.) Liston (*d*) also speaks of the rarity of spontaneous aneurysm at the bend of the elbow; and says:—"I have treated but one such case in the person of an old ship-carpenter. While at work, as usual, he felt something snap in his arm, a pulsating tumour was soon after noticed, and it had attained, during four months, fully

(*a*) Froriep's Notizen, 1835. p. 304.

(*b*) von Graefe und von Walther's Journal, vol. xiv. p. 98.

(*c*) Some Experiments and Observations on tying the Carotid and Vertebral Arteries, and the Pneumo-gastric, Phrenic and Sympathetic Nerves; in Guy's Hospital Reports, vol. i. p. 457, and p. 654.

(*d*) Practical Surgery, 1838. Second Edit. 8vo.

the size of a hen's egg, and was evidently, in part, made up of solid matter. The brachial artery was tied, and every thing went on favourably." (p. 181.)]

1462. If the aneurysm be seated in the trunk of the brachial artery, at the bend of the arm, or in the ulnar (1), radial (2), or interosseal artery near the bend, it is sufficient to tie the brachial artery (*a*). But if it be situated in the middle of the fore-arm, in the region of the wrist, it is necessary to tie the artery near the aneurysmal sac, because the free anastomosis on the back of the hand, is sufficient to support the aneurysm by the reflux of the blood (*b*).

The free anastomosis of the arteries of the arm always renders it advisable to undertake tying the artery near the sac, because in many cases the regurgitation of the blood continues the growth of the sac, and causes its bursting (*par.* 1423.) In an aneurysm originating from wound of the artery, in the middle of the arm, when the sac does not extend far upwards, the opening of the sac is to be effected according to HUNTER's first plan.

[(1) ASTLEY COOPER had seen "only one case of aneurism of the ulnar artery from disease; it was seated where the artery dips under the *pronator radii teres* and flexor muscles of the hand." The artery was tied above the swelling with great difficulty, and "the patient died from the constitutional irritation resulting from this operation." (p. 81.)

(2) LISTON says he has "secured the radial and ulnar arteries in all parts of their course for small aneurysms." (p. 187.) In the College Museum there is a preparation of aneurysm of the radial artery an inch above the origin of the superficial volar branch. ASTLEY COOPER mentions a case in which WILLIAM COOPER, formerly surgeon at Guy's Hospital, "in performing this operation, (tying the radial artery,) found the upper portion of the radial artery obliterated, and that the aneurism was supported by regurgitation from the hand, from the free anastomosis with the ulnar artery." (p. 81.)]

1463. In aneurysm upon the back or front of the hand, tying one or other of the large arteries of the fore-arm does not, on account of the extensive communications which the ulnar and radial arteries have with each other in the hand, prevent the blood flowing back with sufficient power to keep up the aneurysm. If in this case pressure be insufficient for curing the aneurysm, the sac must be opened, and the artery, tied above and below; and if this be not possible, one of the principal arteries of the fore-arm must be tied, the sac opened, and the bleeding arrested by pressure. The same rules must be followed in wounds of the arteries of the fore-arm and hand (*c*).

1464. The brachial artery may be tied in any part of its course, from the arm-pit to the bend of the elbow. Its tying, therefore, must be considered, *first*, at the end of the axillary artery, where it passes beneath the lower edge of the great pectoral muscle; *second*, in the middle of the upper-arm; and *third*, at the elbow-joint.

1465. If the artery be to be *tied in the arm-pit*, the arm must be separated from the trunk, and the fingers carried along the inner edge of *m. biceps* into the arm-pit for the purpose of ascertaining the course of the muscle, and the position of the artery. A cut is then to be made along the inner edge of the *m. biceps*, of two inches in length, which is to extend upwards to the middle of the neck of the upper arm-bone. The skin first and then the *aponeurosis* is to be divided, with a careful

(*a*) SCARPA, above cited, p. 384.—ROUX, Nouveaux Elémens de Médecine Operatoire, vol. i. pt. ii. p. 759.—HODGSON, above cited, p. 393.—WALTHER, above cited p. 58.

(*b*) HODGSON, above cited, p. 394.

(*c*) SCARPA, above cited, p. 407.

cut; or the latter is first raised with the forceps, and cut into with the bistoury held flat, so as to admit a director, upon which it is to be divided. The edges of the wound are now to be separated with blunt hooks from each other, when the inner edge of the *m. coraco-brachialis* and *biceps*, together with the median nerve, are now seen, and behind the latter lies the artery. The nerve is drawn carefully inwards, and the artery which is between it and the edge of the just-mentioned muscles isolated, and the needle carried carefully around it, so as not to include the internal cutaneous nerve.

If the operator keep on the inner edges of the *m. biceps* and *coraco-brachialis*, in the manner recommended, and draw the median nerve inwards, there is no danger of erring, which may easily be done if he keep somewhat more inwards, where the radial or ulnar nerve are met with; and if one of these be mistaken for the median, the artery will be sought in vain. The following is the relative position of the artery:—The artery is separated from the edge of the *m. biceps* and *coraco-brachialis* only by the median nerve; on its inner side is the internal cutaneous nerve, and these two nerves at once cover the front of the artery. Near the cutaneous nerve lies the vein, which frequently forms two or three branches, and these render the isolation of the artery difficult. Still further inwards lie the radial and ulnar nerves.

1466. In order to tie the brachial artery *in the middle of the upper arm*, a cut, two and a half inches long, is made through the skin, along the inner edge of the *m. biceps*. The aponeurotic expansion is then to be divided, and the artery is found on the inner edge of the just-named muscle covered with the median nerve, between its two accompanying veins. The edge of the *m. biceps* is to be taken hold of, and the median nerve drawn somewhat inwards, between which and the edge of the muscle the artery appears, and is easily isolated with the handle of a knife; the ligature is to be carried round it with Deschamps' needle.

The brachial artery frequently divides high up. If the ulnar artery be given off high up, it is always observed to penetrate the *fascia* of the upper arm, and take a superficial course. If the radial originate high up, it for the most part accompanies the ulnar artery to the elbow-joint, and then separates from it (*a*). Tiedemann (*b*), who has very often noticed the high division of the brachial artery in the corpse, found in such cases the radial artery nearly always very superficial at the elbow-joint, immediately under the aponeurotic expansion, from the *aponeurosis* of the *m. biceps*; on which account it is very easily wounded, but can also be as easily tied. The ulnar artery lies beneath this *aponeurosis* of the *m. biceps*. If, on laying bare the brachial artery, two arteries are found, they must be alternately compressed, in order to ascertain whether the pulsation in the aneurysm be stopped, for the purpose of tying that one in which it is seated.

1467. To tie the brachial artery *at the bend of the arm*, a cut two inches long is to be made through the skin on the extended arm, in the direction of a line imagined to be drawn from the middle, between the two condyles of the upper arm-bone, obliquely inwards and upwards towards the inner edge of the *m. biceps*. The veins lying beneath the skin are to be avoided, the superficial *aponeurosis* of the *m. biceps* is to be opened without or with a director introduced, and the artery isolated, for which purpose the fore-arm should be somewhat bent.

The median nerve here lies upon the inside of the artery three or four lines distant from it; the median basilic vein lies sometimes upon, sometimes at the side of, and frequently beneath the artery; and farther outward is the median cephalic vein.

1468. To *lay bare the radial artery in the upper third of the fore-arm*,

(*a*) Hodgson, above cited, p. 391.
(*b*) Walther, above cited, p. 63. Tabulæ Arteriarum, pl. xiv. xv.

a cut should be made, about two inches long, through the skin, a little below the insertion of the tendon of the *m. biceps*, in the oblique direction of the ulnar edge of the *m. supinator longus*. The *aponeurosis* of the fore-arm is to be divided in the same direction, and the edge of the just-mentioned muscle inclined somewhat outwards, when the artery appears in the interspace between it and the *m. flexor carpi radialis*. A branch of the musculo-cutaneous nerve lies upon the outer side of the artery, which is accompanied by one or two veins.

In *laying bare the ulnar artery in the upper third of the fore-arm*, a cut two inches and a half long is to be made between the radial edge of the *m. flexor carpi ulnaris*, and the *m. flexor digitorum sublimis*, through the skin and *aponeurosis* of the fore-arm. The artery lies rather under the edge of the *m. flexor digitorum sublimis*, accompanied by a vein, and on its outer side by the ulnar nerve.

In *the lower part of the fore-arm*, where these arteries are quite superficial, they are very easily laid bare. With the radial artery the cut falls on the radial side of the tendon of the *m. flexor carpi radialis;* with the ulnar artery between the tendons of the *m. flexor carpi ulnaris* and *flexor sublimis digitorum*.

If the *ulnar artery be tied in the region of the wrist*, a cut an inch and a half long, and three or four lines to the outside of the pisiform bone, should be made through the skin and fatty cellular tissue, which often fills up the whole wound, and, in such case, must be in part removed. The ulnar nerve is now found opposite the pisiform bone, and to its outer side the ulnar artery, accompanied by two veins. The artery should be isolated, and the ligature applied above the origin of its hinder branch which anastomoses with the deep palmar arch.

To *tie the end of the radial artery*, the hand must be brought prone, and bent somewhat towards the fore-arm. A cut is to be made from the outside of the styloid process of the spoke-bone, to the upper part of the interspace separating the first and second metacarpal bones. After cutting through the skin, the veins coming into view are to be drawn outwards or inwards, and the delicate branches of nerves which cross the wound divided. The position of the tendons of the *m. extensor longus* and *brevis pollicis* is now to be ascertained, and between them, and towards the most depending part of the *carpus*, a kind of soft and thick *aponeurosis*, which covers this part, is to be divided. Beneath it are some little masses of fat, which, if in the way, are to be removed, and then upon the carpal bones a thin aponeurotic layer is seen, which allows the artery, with its accompanying veins, to show through. This layer is then divided upon the director, and the artery easily isolated (*a*).

1469. The supply of blood to the arm, after tying the brachial artery, is effected by the branches of the *arteria profunda humeri*, and the anastomoses of the recurrent radial, ulnar, and interosseal arteries. If the brachial be tied above the origin of the *arteria profunda*, the blood flows through the ramifications of the circumflex humeral and subscapular arteries, into the ascending branches of the *arteria profunda*, and the recurrent radial and ulnar arteries.

[White, of Manchester (*b*), has given a beautiful engraving of the circulating

(*a*) Manec, above cited, pl. vii. viii. (*b*) Cases in Surgery, p. 139. London, 1770. 8vo.

branches fourteen years after the brachial artery had been tied just above the bend of the elbow, for a wound in bleeding.

In the Museum at St. Thomas's Hospital are two beautiful preparations of the anastomotic branches enlarged after the brachial artery had been tied. In the one a long portion of the artery had been obliterated, and sets of vessels are descending on either side from above the obliteration, to be received into others which ascend in similar manner from below it. In the other the obliteration is less extensive, and a single curved artery about as big as a crow-quill passes from the upper to the lower open part of the artery.—J. F. S.]

IV.—OF ANEURYSM OF THE EXTERNAL AND INTERNAL ILIAC ARTERY.

1470. Astley Cooper (*a*), in an aneurysm which extended four inches above and as many below Poupart's ligament, and had burst, undertook to *tie the abdominal aorta*. For this purpose he made a cut into the white line three inches in length, in the middle of which was the navel, which, by a curve in the wound, was placed on its left side, and then a small opening made into the *peritonæum*, which was lengthened with a button-ended bistoury to the extent of the external wound. He then passed his finger between the intestines, down to the spine, scratched with his nail through the *peritonæum* on the left side, carried his finger gradually between the spine and *aorta*, and then passed a single ligature with a blunt aneurysmal needle around it. The ligature was carefully tied without including intestine, and the wound brought together with the quill suture and sticking plaster. The patient died forty hours after the operation; sensation and warmth had, however, returned on the thigh of the healthy side, but that of the diseased side was cold and bluish.

James (*b*), on account of an aneurysm of the external iliac artery, first tied the femoral, according to Desault's and Brasdor's proposal; and the aneurysm at first diminished a little, but soon increased. He then proceeded to tie the abdominal *aorta* as Astley Cooper had done, only that he began his cut in the white line an inch above, and terminated it two inches below the navel. The patient died the same evening.

Murray (*c*) tied the *aorta* on account of a very extensive iliac aneurysm. He made a cut through the skin and muscles, beginning from the jutting extremity of the tenth rib, and continuing it about six inches down, curving in a direction backwards to an inch from the upper front spine of the hip-bone. He divided the transverse *fascia* on a director, separated with his hand, carried in flat, the *peritonæum* from the sheath of the *m. iliacus internus* and *psoas*, and easily reached the *aorta*. Passing the finger between the spine and *aorta* was more difficult, as also was the separation of the nervous *plexus* and the sheath of the *aorta*, which he effected partly with his nail, and partly with an elevator. Passing the aneurysmal needle was also very difficult. Drawing the ligature together did not excite any pain. The patient lived twenty-three hours after the operation.

It may be more convenient, as recommended by Astley Cooper, in tying the

(*a*) His and Travers' Surgical Essays, vol. i. pt. i. p. 393.

(*b*) Medico-Chirurg. Trans., vol. xvi. p. l.

(*c*) London Medical Gazette, vol. xiv. p. 68, 1834.

abdominal *aorta*, to make the cut about an inch distant from the epigastric artery, outwards and running parallel to it, and to proceed as in tying the internal iliac artery.

According to GUTHRIE's recent views, it is in no case necessary to tie the *aorta*, because in an aneurysm of the external or internal iliac, the common iliac on the diseased side can always be got at, and if not there, yet on the healthy side, for the purpose of carrying a ligature around it.

[The *aorta* was also tied by C. D. MONTEIRO (*a*) at Rio Janeiro, *Aug.* 5, 1842, for an aneurysm of the femoral artery, close to the groin, which on examination turned out to be spurious, by the vessel having burst and formed a large swelling, occupying a great portion of the right under part of the belly. The incision was made on the left side, from the tip of the last false rib to the upper front iliac spine, through the abdominal walls, avoiding the *peritonæum*. The fingers were then carried down to the *aorta*, and a ligature with great difficulty passed around it by means of a ligature-needle. But little blood was lost. As soon as the ligature was tied, the aneurysm sunk down, but the artery swelled up (?), and for some time remained as a thick large knot. The case went on well till the *eighth* day; at three, P. M., arterial blood escaped through the dressings; it did not, however, affect the pulse, but patient's countenance was sunken and hollow. The bleeding continued, and on the *tenth* day, at 10 A. M., he died. The ligature had been placed two lines above the bifurcation of the *aorta;* a small opening was found on the left side of the vessel, immediately above the ligature.]

1471. If an aneurysm be situated on the external or internal iliac artery, or if it have extended so far upwards that there is not sufficient space between the aneurysm and the origin of these arteries to apply a ligature, tying the common iliac artery is indicated. GIBSON (*b*) tied this artery for a wound; MOTT (*c*) on account of an aneurysm of the internal iliac artery, CRAMPTON (*d*) and SALAMON (*e*) on account of a large external iliac aneurysm; LISTON for secondary hæmorrhage; GUTHRIE for a presumed aneurysm of the gluteal artery; also SYME, DEGUISE, and PEACE (*f*); but MOTT's, SALAMON's, DEGUISE's, and PEACE's operations alone were successful.

1472. In order to *tie the common iliac artery*, an imaginary line must be drawn from the upper front spine of the hip-bone directly towards the white line: two and a half inches above this line, and two lines from the outer edge of the *m. rectus abdominis*, a cut should be begun, carried obliquely downwards and outwards, and terminated an inch and a half below the line, so that it has a length of from four to five inches. In this direction, the skin, the *fascia* of the external oblique muscle, the muscle itself, and then the *fascia* of the internal oblique muscle, are cut through; the transverse muscle with its *aponeurosis* is then divided with some careful strokes of the knife, or a director is introduced, and they are divided upon it. Any spouting vessel must be tied; the edges of the wound drawn asunder with blunt hooks by an assistant, and with the finger passed down into the wound, or with the handle of the knife, the cellular connexion of the *peritonæum* with the surrounding external parts must be divided. The patient's trunk is then to be inclined towards the

(*a*) From a letter of LALLEMENT's; in SCHMIDT's Jahrbücher der in und auslandischen gesammten Medecin. Jahrgang, 1843. Leipz.

(*b*) American Medic. and Surg. Recorder, 1820, vol. iii. p. 185.

(*c*) American Journal of Medical Sciences, vol. i. p. 156, 1827.

(*d*) London Medical and Surgical Journal, vol. v. p. 382.

(*e*) FRORIEP's Notizen, vol. iv. No. 3, 1837.

(*f*) Dublin Journal of Medical Science, vol. xxiii. p. 214, 1843, extracted from the Philadelphia Medical Examiner.

healthy side, so that the intestines may drop away from the wound, and the division of the outer and under parts be facilitated. If there be not any diseased thickening, the separation is easy; but if there be, the bistoury must be used with the greatest care. The *peritonæum* with the *ureter* is now to be borne upwards, and being kept in that position with a spatula, by an assistant, the finger is to be carried down to the artery, which lies in a position corresponding with the cut. Below the artery and a little inwards, the accompanying vein lies; and at the lower angle of the wound pass branches of the ilio-lumbar artery and veins. The sheath of the artery must be torn with the nail of the forefinger, or with the handle of the scalpel, according as it is thinner or thicker; the artery is then isolated, and the needle carried round it, whilst the vein is pressed inwards (*a*).

Mott made a cut, five inches long, beginning immediately above the external abdominal ring, and continued in a semi-lunar direction half an inch above Poupart's ligament, to a little above the front spine of the hip-bone; he then divided the external and internal oblique and transverse muscles, and separated the *peritonæum* from its cellular connexions.

Crampton carried a cut, seven inches long, from the seventh rib, downwards and forwards, to the front spine of the hip-bone, in a semicircular form, with its concavity towards the navel, cut through the three abdominal muscles, and separated the *peritonæum*.

According to Anderson (*b*), the cut should be commenced from the upper and front spine of the hip-bone, half an inch above Poupart's ligament, parallel with it, continued towards the share-bone, and curved somewhat upwards, so that it is four inches long; cutting through the three abdominal muscles, and so on.

Salamon made a cut about an inch from the upper front spine of the hip-bone, proceeding at similar height from it, and in parallel direction to the epigastric artery, terminating about a finger's breadth below the last false rib, and from four to four and a half inches long. The division of the abdominal muscles and transversal *fascia*, and so on.

1473. If an aneurysm be situated on a branch of the internal iliac artery, to wit, on the ischiatic or gluteal artery, tying the internal iliac is indicated, as the practice followed by J. Bell (*c*) in a case of ischiatic aneurysm arising from injury, viz., opening the sack and tying the artery above and below the wound is extremely dangerous, and only in few cases can be permissible. W. Stevens (*d*) tied the internal iliac artery for an aneurysm above the ischiatic notch; J. Atkinson (*e*) on account of a gluteal aneurysm, so also White (*f*); Mott (*g*), for a gluteal or ischiatic aneurysm. Atkinson's and Mott's cases were unfortunate, but the other two had the happiest result (1).

[(1) The internal iliac artery has also been tied successfully by a Russian army-Surgeon (*h*); also by my friend Thomas, of Barbadoes, but the patient died, and the preparation is in Guy's Museum (*i*).]

1474. To *tie the internal iliac artery*, a cut of five inches in length is to be made through the skin and three muscles, upon the under and outer side of the belly, parallel to the course of the epigastric artery, and an inch to its outer side. The exposed *peritonæum* is to be separated with

(*a*) Dietrich, above cited, p. 288.
(*b*) System of Surgical Anatomy, p. 1.
(*c*) Principles of Surgery, vol. i. p. 421.
(*d*) Medic. Chir. Trans. vol. v. p. 422.
(*e*) London Medical and Phys. Journal, vol. xxxviii. 1816.
(*f*) American Journal of Medical Sciences, vol. i. p. 304. 1828.
(*g*) Ibid., vol. xx. p. 1, 1837.
(*h*) Averill's Operative Surgery, p. 79.
(*i*) Med. Chir. Trans., vol. xvi. p. 230.

the finger from the *m. iliacus internus* and *psoas magnus*, and the finger carried down to the internal iliac artery which should be detached by it from its connexions; and about half an inch below its origin a ligature is to be carried round it with an aneurysmal needle.

In this way Stevens proceeded, and this operation is most proper and safe. White made a semicircular cut seven inches long, beginning two inches from the navel, and continuing it nearly down to the external inguinal ring.

According to Anderson and Bujalsky, the cut should be begun a finger's breadth above the upper front spine of the hip-bone, or even higher, and half an inch distant from Poupart's ligament, but continued parallel to it for about three inches towards the share-bone. Cutting through the three abdominal muscles, separation of the *peritonæum* and retracting it together with the spermatic cord upwards.

[The following are the particulars of Owen's dissection (*a*) of Stevens' case. The woman died ten years after the internal iliac artery had been tied. The internal iliac artery had become impervious at the part where the ligature had been applied, and "the ilio-lumbar appears to have arisen just above this point, the obliteration in consequence had not extended to the origin of the external iliac. In the state of a ligamentous cord, the internal iliac descended towards the ischiatic notch for the space of an inch, and then suddenly resuming its natural diameter it again became pervious, and so continued for the extent of half an inch; the glutæal artery arising from the lower part of this space; a sacro-lateral vessel from about the middle; and the obturator artery from the upper part of it. The latter vessel was, however, entirely obliterated, but the sacro-lateral artery was pervious, of the size of a crow quill, and passed inwards to the second sacral *foramen;* whilst the glutæal artery, of its natural size, received close to its origin two vessels as large as the preceding, given off from the sacro-lateral artery, near the third and fourth sacral *foramina* of the left side. The anastomoses of the sacro-lateral arteries with each other and the sacro-median were large and tortuous. Immediately after the origin of the glutæal artery, the ischiatic, obliterated and cord-like, passed on to the lower part of the ischiatic notch; the sanatory processes set on foot by the application of the ligature being uninterrupted by the enfeebled current of blood passing from small canals to a large one. Many vessels met with in the course of the dissection of the *glutæus maximus* and *medius* were found to have received the injection. The glutæal artery was in a healthy condition, and of the natural size; but an elongated tumour, situated between the tuberosity of the *ischium* and the great *trochanter* indicated the true seat of the original disease. This tumour in length three inches and a half, and above two-thirds of an inch in breadth, was of the sciatic artery, and consisted of layers of condensed cellular membrane and the peculiar fibrous arterial coat. It contained a quantity of dark-coloured granular not lamellated coagulum, which, when removed, showed the internal surface of the sac to be somewhat irregular and raised in small patches by the deposition of soft matter. In some places it appeared to retain the smooth character of the arterial lining membrane. From the ischiatic notch to the tumour, the artery was completely obliterated, its texture altered and the remains of the cavity filled with indurated and partly calcareous matter. From the lower part of the tumour the sciatic artery was continued down the posterior part of the thigh of an uncommon size, nearly as large as the femoral artery in front; its calibre did not, however, correspond with the apparent magnitude, for its coats were thicker, by at least one-half than any artery of the same size with itself. It was obliterated for about the space of an inch below the sac, and became pervious after receiving an anastomosing vessel from the *arteria profunda*. A vessel ramifying between the *glutæus maximus* and *medius*, and distributing branches to these muscles, was connected to the commencement of the sac, from which it had probably arisen; it did not, however, open into the sac, but after becoming contracted near the point of attachment, it there gave off a small artery to the *quadratus femoris* and received its blood by anastomosing near the *crista ilii*, with a superficial branch of the glutæal artery. A smaller vessel was similarly attached to the lower part of the aneurysmal sac, but neither did it communicate with that cavity, for the blood which it received from branches ramifying in the neighbourhood was diverted from the sac by a small branch given off at the point of attachment." (pp. 222–25.)]

(*a*) Med. Chir. Trans. vol. xvi.

1475. *If the gluteal artery is to be tied*, a cut three inches long should be made through the skin and cellular tissue, commencing at the upper hinder spine of the hip-bone, and carried in the direction of the fibres of the great gluteal muscle, towards the great *trochanter*. The fibres of the great and middle gluteal muscle are to be divided in the same direction, to the lower edge of the hip-bone and the artery found.

Carmichael (*a*) tied the gluteal artery, for spurious aneurysm, by a penknife wound in the way just directed. From one to two pounds of coagulated blood were emptied out. The vessel could not be taken up with a tentaculum; but a ligature, with a large common needle, having been passed round it, was tied, and came away in six days. The boy was convalescent in sixteen days.

To *tie the ischiatic artery*, a cut two and a half inches long must be made through the skin and cellular tissue, commencing immediately below the under hind spine of the hip-bone, and continue along the fibres of the great gluteal muscle, towards the outside of the tuberosity of the haunch-bone, where it is connected with the rump-bone, and the artery is found lying on the ischio-sacral ligament (*b*).

1467. If *the common pubic artery is to be tied*, a cut of an inch or an inch and a half long should be made along the inside of the descending branch of the haunch-bone, through the skin, cellular-tissue, *fascia* of the great gluteal muscle, and through the muscle itself. The edges of the wound are to be kept asunder with blunt hooks, by which a layer of fat is exposed, and beneath it lies the artery. This is to be divided, or partially removed till the *m. erector penis* be laid bare, on the inner side of which muscle lies the vessel, accompanied by two veins and a branch of the pudic nerve. The transverse perinæal artery also accompanies the pudic, running almost parallel with it. The artery is to be carefully isolated, and the needle carried round it, from within outwards (*c*).

[In the Museum of the Royal College of Surgeons there is an example of aneurysm of the pudic artery an inch in diameter, and nearly filled with clot. Whilst alive, the patient had a strongly pulsating tumour under the left great gluteal muscle; he was much out of health, and died. On *examination*, there was found beneath the hinder edge of the muscle a tumour, as large as a walnut, upon the ischiatic notch, and adhering to the ischiatic nerve as it left the *pelvis*. The artery was the internal pudic, and it was healthy above till it at once dilated into an aneurysm, below which it was obliterated, so that there was no outlet for the blood: the coats were strong like the coats of many cysted tumours.—J. F. S.]

V.—OF ANEURYSM OF THE FEMORAL AND POPLITEAL ARTERIES AND THEIR BRANCHES.

1477. Abernethy (*d*) was the first who tied the external iliac artery in the groin for aneurysm. This case, although not successful, showed the possibility of the limb being sufficiently supplied with blood after obliteration of the artery.

[The first time Abernethy tied the external iliac artery was in the early part

(*a*) Dublin Journ., vol. iv. p. 231, 1833.
(*b*) Zang, Operationslehre. Third Edition, vol. i. p. 203.
(*c*) Dietrich, above cited, p. 244.
(*d*) On Aneurysms; in the Medical and Physical Journal, vol. vii. p. 97, 1802, and in his Surgical Works, vol. i. p. 254. The first case here mentioned is cited from the latter, and the second from the former work. —J. F. S.

of the year, 1796, on a patient in St. Bartholomew's Hospital who had popliteal aneurysm in one, and femoral aneurysm in the other leg. The femoral artery was tied for the cure of the former by Sir Charles Blicke with two ligatures, between which it was divided; the upper ligature came away on the tenth and the lower on the fifteenth day, and the cure was perfected. "About five weeks after this operation, the aneurism in the opposite thigh was almost ready to burst, the tumour having acquired a pyramidal form, and the skin covering the apex having yielded so much as to form a kind of process from the tumour. Indeed the integuments at this part were so thin, that we every hour expected them to give way. The aneurism was situated so high, as to make it probable that the disease extended above the place where the *arteria profunda* is sent off," and prevented pressure being made upon the artery, except at the place for incision; but even here it did not stop the pulsation, and troublesome bleeding occurred during the operation. A small opening made in the *fascia* of the thigh admitted the finger, upon which it was divided up to Poupart's ligament, and down to the sac. The pulsation directed the finger and thumb to the artery, which was tied with two ligatures, the upper half an inch from the *os pubis*, and the lower the same distance from the *arteria profunda*, but the artery was not divided between them. "The tumour diminished greatly after the operation, and the blood contained in it became coagulated, which it did not appear to have been before the operation." * * * Every thing went off well till the fifteenth day, when the upper ligature separated, and the blood gushed in a full stream from the open extremity of the vessel. The bleeding was stopped by pressure. The stream of blood which flowed upon any remission or wrong application of the pressure was so large that we did not dare to remove the patient even from the bed on which he lay. Mr. Ramsden undertook, in this situation, to prevent the further escape of blood from the vessel, whilst I proceeded to tie the artery above Poupart's ligament. Accordingly, I first made an incision, about three inches in length, through the integuments of the *abdomen*, in the direction of the artery, and thus laid bare the *aponeurosis* of the external oblique muscle, which I next divided from its connexion with Poupart's ligament, in the direction of the external wound, for the extent of about two inches. The margin of the internal oblique and *transversalis* muscles being thus exposed, I introduced my finger beneath them for the protection of the *peritonæum*, and then divided them. Next with my hand I pushed the *peritonæum* and its contents upwards and inwards, and took hold of the external iliac artery with my finger and thumb, so that I was enabled to command the flow of blood from the wound. It now only remained that I should pass a ligature round the artery and tie it; but this required caution, on account of the contiguity of the vein to the artery. I could not see the vessels, but I made a separation between them with my fingers. Having, however, only a common needle with which to pass the ligature, I several times withdrew the point from apprehension of wounding the vein. After having tied the artery about an inch and a half above Poupart's ligament, I divided that part, and thus laid bare the new and former wound into one. * * * No adhesion took place between the divided parts; the edges of the wound were open and sloughy. * * * Still no greater mischief appeared till the fifth day after the operation, when a hæmorrhage of arterial blood took place in such quantity that there was no doubt but that it arose from the principal artery, though the ligature with which it was tied still remained firm." No further attempt at tying the vessel higher up was made, but compresses were fixed with a bandage, and continued for three days, but there was still occasional, though not profuse bleeding. "In the course of the eighth day after the last operation he died." On *examination*, it was found, that "for nearly two inches above the part which was tied, the lymphatic glands covering the artery were considerably enlarged. The external surface of one of them next the wound had ulcerated, and the ulceration penetrated through the gland, and communicated with the artery. * * * The ulcerated opening from the artery, through the diseased gland, admitted the passage of a moderate-sized bougie." (pp. 254-66.) Abernethy remarks:—In this case I thought I disturbed the *peritonæum* too much, and tied the artery higher than was necessary." (p. 269.) This accordingly he avoided in his second operation on the 24th of October, 1801, and having divided the edges of the internal oblique and transversal muscles, "I now introduced," says he, "my finger beneath the bag of the *peritonæum*, and carried it upwards by the side of the *psoas* muscle, so as to touch the artery about two inches above Poupart's ligament. I took care to disturb the *peritonæum*

as little as possible, detaching it to no greater extent than would serve to admit my two fingers to touch the vessel." (p. 99.) The artery was then tied with two ligatures and divided between. He went on tolerably till the fifth day when "the wound and contiguous parts looked remarkably well, but a bloody sanies was discharged which I felt unable to account for. On the sixth day the state of his health and limb continued as well, if not improving. The bloody discharge, however, had increased in quantity, insomuch that it ran through the coverings of the wound and soiled the bed; it had also become fœtid. * * * I could not believe that a healthy wound would secrete such a sanies, and I felt apprehensive lest the wound should spread from disease. Nothing, however, took place to confirm this idea. It seemed probable, also, that if the aneurysmal sac were not entire, some of the blood being exposed to the air, might tinge the discharge from the wound and grow putrid. I frequently pressed on the tumour, but could press no blood from the wound." On the ninth day he "appeared like a man advanced in typhus fever. * * * On examining the wound, with a view to discover the cause of this great and sudden alteration, and pressing on the tumour beneath POUPART's ligament, I forced out a great quantity of blood rendered fluid and highly fœtid by putrefaction." He continued slowly sinking, and died "on the twenty-third day after the operation. A few days before his death both ligatures came away with the dressings." On *examination*, it was found that "the *peritonæum* was separated from the loins, and from the posterior half of the left side of the *diaphragm*, by a considerable collection of blood which extended below, to POUPART's ligament, and communicated under that ligament with the aneurysmal sac. This opening was situated in the direction of that crevice which is found between the internal iliac and *psoas* muscle. The only rational explanation that can be given of the formation of this collection is, that the blood had burst its way from the aneurysmal sac in the vacancy between the muscles just mentioned, after which it would readily and extensively separate the *peritonæum* in the manner described. * * * The extremities of the external iliac artery, which had been divided in the operation, were united together by a fine newly-formed substance; the sides of each extremity were perfectly closed, and a small plug of coagulated blood was found in each. * * * It seems evident that, in the present instance, the operation was too long delayed. It would be desirable in future to perform the operation before an extensive diffusion of blood had taken place; indeed, could the adequateness of the collateral arteries for the supply of the limb be established, it would be proper to operate before the artery had burst." (pp. 101–104.) ABERNETHY's third case operated on the 11th of October, 1806, on which the ligatures came away,—the lower on the fifth, and the upper on the fourteenth day,—succeeded, as did also his fourth on the 25th of February, 1809, in which the ligatures came away on the tenth day. ABERNETHY's case, was not, however, the first successful one as on the 4th of October, 1806, FREER (*a*) tied the external iliac artery with a single ligature, which came away on the sixteenth day, just anticipated ABERNETHY's by five days. Within the year, TOMLINSON of Birmingham also successfully tied the same vessel with a single ligature, which separated on the twenty-sixth day. ASTLEY COOPER's first case, also successful, is most important of all, though not performed till the 22d of June, 1808, as he had the opportunity on the patient's death, 18 years after, of examining the condition of the tied vessel and of the anastomosing arteries.

Both external iliac arteries have been taken up in the same subject at the interval of a week, in one instance by TAIT (*b*), and in the other by ARENDT (*c*), and did well.]

1478. Tying the *external iliac artery* is not merely indicated in aneurysms above the *arteria profunda femoris*, but also in those below the origin of that artery, which extend so close to POUPART's ligament, that there is no space for the operation between it and the aneurysm; which practice is certainly preferable to opening the sac, with compres-

(*a*) Above cited, p. 80.
(*b*) SAMUEL COOPER's Surgical Dictionary, p. 157.
(*c*) VELPEAU, Nouv. Elémens de Médecine Opératoire, vol. i. p. 175.

sion of the femoral artery on the horizontal branch of the share-bone, in order to avoid the *arteria profunda.*

1479. The *external iliac artery, is to be tied* in the following manner. The patient being placed on a couch with his buttocks somewhat raised, the operator stands on the side on which the operation is to be performed, and makes a cut through the skin and cellular tissue, commencing half an inch to the inside of the upper front spine of the hip-bone, and terminating at the middle of POUPART's ligament. The cut should be continued in the same direction, through the *aponeurosis* of the external oblique muscle, the muscular fibres of the internal oblique muscle, and with the greatest care through the thin *aponeurosis* of the transverse muscle, so as not to wound the *peritonæum.* The exposed *peritonæum* is to be separated with the finger at the lower angle of the wound, from its yielding connexion with the *m. iliacus internus;* and pressing it inwards, the external iliac artery is felt, accompanied on the inside by the vein, and on the outside by the crural nerve. It is then to be isolated with the finger or with the handle of the knife, and the ligature carried round it with DESCHAMPS' needle; this last proceeding can, at least in the dead body, be facilitated by bending the thigh at the hip-joint.

The decisions as to the direction and size of the cut in this operation are very various. They may be arranged in three classes.

1. With a nearly *straight* cut.

ABERNETHY made a cut four inches long, commencing an inch and a half from the upper front spine of the hip-bone, nearer the white line, and carried it down in the direction of the external iliac artery to half an inch above POUPART's ligament. He divided first the skin, then the *aponeurosis* of the external oblique abdominal muscle, and carried his finger under the lower edge of the internal oblique and transverse muscles in order to protect the *peritonæum* whilst he divided those muscles with a common or button-ended bistoury. The *peritonæum* was pressed back with the finger.

According to CHARLES BELL, the cut should be commenced at the outer pillar of the abdominal ring, carried outwards and upwards, and terminated half an inch above the upper front spine of the hip-bone, and two fingers' breadth to its inner side. The *aponeurosis* of the external oblique muscle is then to be divided from the ring upwards, upon a director, the lower edge of the internal oblique muscle raised, the spermatic cord drawn inwards and upwards, with a blunt hook, the cellular tissue put aside, and the artery isolated. But if there be not sufficient space to apply the ligature, the internal oblique muscle must be divided upwards and outwards.

SCARPA begins the cut half an inch under the upper front spine of the hip-bone, and an inch and a half from it nearer the white line, and carried down near to the crural arch. Division of the three abdominal muscles and separation of the *peritonæum.*

(2) With a *semilunar* cut.

ASTLEY COOPER makes a semielliptical cut, beginning near the spine of the hip-bone and terminating a little above the inner edge of the outer abdominal ring. The *aponeurosis* of the external oblique is divided in the same direction. This flap being now a little raised, the course of the spermatic cord is seen, and if followed by the finger under the edge of the internal oblique muscle, the opening in the *fascia transversalis* (inner ring) is entered, and the finger touches the artery (4).

The practice of LISFRANC and ANDERSON agrees with this, but the latter makes the cut less curved and a little shorter, (not quite three inches,) separates the skin upwards and downwards, and dividing the *aponeurosis* of the external oblique muscle, terminates the cut a little before the external abdominal ring. The *aponeurosis*

is then to be separated from the internal oblique muscle, with the handle of the knife: the spermatic cord now exposed, is to be raised, and its sheath lifted up and cut through with the knife or scissors. Through this aperture the little finger of the right hand is to be carried to the internal ring, and the artery being reached, is then to be separated from the iliac *fascia* and vein by the introduction of a silver aneurysmal needle, and tied.

Rust considers that the cut should be made in the same way, only three and a half inches long, through the three abdominal muscles and the epigastric artery, which must at once be tied.

(3) With an *oblique* incision.

Lagenbeck, Delpech, and others, determine that the cut should be commenced two fingers' breadth from the upper front spine of the hip-bone, and continued across towards the *m. rectus* a finger's breadth from Poupart's ligament, so that the cut should be four fingers broad. The division of the three abdominal muscles and so on.

Wright, Post, (*a*), in a case of an aneurysm extending high up, made a cut four inches long, from the upper end of the swelling, to a point, between the navel and the upper front spine of the hip-bone. The *peritonæum* much thickened by the pressure of the swelling needed cutting. Bujalsky also makes the incision in the same direction.

Compare Dietrich (*b*) on the preference and objections to these different operations.

[(4) Upon Cooper's mode of tying the external iliac Guthrie observes:—It offers the advantage of greater space, which enables the surgeon to see better what he is doing; but it does not so readily admit of the artery being tied high up, without an additional incision being made in a direction different from the first, which is after all a matter of no consequence, if it were found necessary to do it." (p. 375). He also mentions that he "has seen the epigastric artery divided in this operation. * * * If the surgeon has unluckily divided it, either in this or in any other operation, all that he has to do is to enlarge the incision and tie both the divided ends; and I have no hesitation in saying it will not be of any consequence, either in this operation or in one for *hernia*. If a man has been so unfortunate as to have a wound in his *peritonæum* of a quarter or of half an inch in extent, two ligatures on the epigastric artery, and a slight increase on the extent of the external incisions, add little or nothing to the danger, which only takes place in reality when the wound is closed up, and the artery is allowed to bleed internally." (p. 376.) Dupuytren did not, however, find this to be exactly the case when he divided the epigastric artery in 1821; the bleeding was very copious, and though he stopped it by putting on two ligatures, the patient died in a few days of *peritonitis*. (*c*).]

1480. If there be room *beneath* Poupart's *ligament to apply a ligature around the femoral artery*, a cut is to be made midway between the iliac spine and pubic *symphysis*, beginning at the edge of Poupart's ligament and continued somewhat obliquely from above downwards. The skin and underlaying fat are to be divided, the glands separated, and the superficial layer of the *fascia lata* divided, where the artery is found in the canal formed by the two layers of that *fascia*, having the vein on the inner, and the nerves on the outer side.

The femoral artery commonly gives off the *arteria profunda* an inch and a half, or two inches below Poupart's ligament; but it frequently arises before the femoral artery has passed under Poupart's ligament. For this reason the direction to begin the cut an inch below Poupart's ligament is improper, because here, manifestly, although the cut may be several inches long, yet the space is too confined for isolating the artery.

Textor and Robert Froriep make a cut two and a half inches long, half an inch below Poupart's ligament, and parallel to its lower edge, so that it corresponds to the middle of the femoral ring. In the same direction the cellular tissue and

(*a*) American Med. and Phil. Register, vol. iv. p. 443.

(*b*) Above cited, p. 284.

(*c*) Averill's Operative Surgery, p. 73.

fascia are to be divided upon a director, in doing which the director is only to be introduced a short distance, and the division to extend three lines from the two edges of the wound.

1481. The vessels by which the circulation is kept up, after tying the external iliac artery, are the anastomoses, between the gluteal, ischiatic, internal pudic, and obturator, with the circumflex arteries, which arise from the deep artery, from the external pudic, epigastric, and circumflex iliac arteries. If the obturator arise from the epigastric, a large quantity of blood passes through its anastomosis with the internal pudic and ischiatic, and the branches of the circumflex artery of the thigh. The epigastric and circumflex iliac artery also convey blood by their anastomoses with the internal mammary, with the intercostal, lumbar, and sacral arteries. If, therefore, the aneurysm be below the epigastric artery, there may be, after the obliteration of the external iliac artery, a flow of blood above the seat of aneurysm into the artery, but no enlargement of the aneurysm from it is to be feared (1).

There are a considerable number of cases in which the external iliac artery has been tied. Fifteen out of twenty-two have been (according to Hodgson) cured; a very good proportion, if it be remembered that many of the patients had been already much weakened by previous bleeding from the sac (*a*).

[Mott (*b*) tied the external iliac artery fourteen days after tying the femoral of the other limb; in both on account of aneurysm. The case did well.

The following are the principal points in the dissections of three of the cases in which Astley Cooper tied the external iliac artery.

In the case (*c*), which died ten weeks and six days after the operation, "it was found that the femoral, tibial, and fibular arteries were still open, and that the blood was conveyed into the femoral artery by the following anastomoses. The internal pudendal artery formed several large branches upon the side of the bulb of the *penis*, and these branches freely communicating with the external pudendal artery had determined the blood into that artery, and by this channel into the femoral; the lateral sacral artery also sent a branch on the *iliacus internus* muscle, into the femoral artery, and the ilio-lumbar artery freely communicated with the *circumflexa ilii*; so that, by these three routes, the blood found direct ingress to the femoral artery. Numerous branches of arteries also passed from the lateral sacral to the obturator and epigastric arteries, the obturator in this case having its origin from the epigastric. Besides these arteries, a free communication existed between the *arteria profunda* and circumflex arteries, with the branches of the internal iliac; first, the gluteal artery sent a branch under the *glutæus medius* muscle to the external circumflex artery; secondly, the ischiatic artery gave two sets of branches of communication, one upon the *glutæus maximus* muscle to the *arteria profunda*, and another upon the sciatic nerve to the internal circumflex artery; the internal pudendal artery also sent a branch of communication to the internal circumflex; lastly, the obturator freely communicated with the internal circumflex." (pp. 428, 29.)

In Cooper's second case (*d*), "examined, at three years after tying the external iliac artery," the external iliac and the femoral arteries were obliterated, excepting about an inch of the femoral artery, just below Poupart's ligament, which still remained open, and continued to convey a portion of the blood; but, below this part, it had become simply a ligamentous cord. The internal iliac artery sent first a very large artery of communication to the epigastric and obturator artery, so that the epigastric was supplied with blood from the internal iliac; secondly, the internal iliac sent an artery of communication upon the sciatic nerve, to the internal circumflex artery. The gluteal artery gave a large branch to the origin of the *profunda;* lastly, the internal pudendal artery largely anastomosed with the obturator; the obturator, therefore, sprang in this case from two new sources, viz. from the internal iliac, and from the internal

(*d*) Hodgson, above cited, p. 416.
(*b*) American Journal of Medical Sciences, vol. i. p. 483.
(*c*) Med.-Chir. Trans., vol. iv. 1813.
(*d*) Ibid.

pudendal artery, and the obturator thus formed sent two branches of communication to the internal circumflex artery. The *arteria profunda* was in this case supplied from two sources directly from the gluteal, and more indirectly from the internal circumflex, by the obturator and ischiatic arteries. The external iliac artery was obliterated to the origin of the internal iliac, as other arteries usually are when ligatures are made upon them to the first large anastomosing vessel. The principal agents then of the new circulation are the gluteal artery with the external circumflex, the obturator artery with the internal circumflex, and the ischiatic with the *arteria profunda*, and the obturator artery is supplied with blood principally by the internal pudendal when the obturator arises from the epigastric artery." (p. 429–31.) Both preparations are in St. Thomas's Museum.

In Cooper's third case (*a*), eighteen years after the operation, "the external iliac artery was pervious to the extent of rather more than an inch from the bifurcation of the common iliac, but had become somewhat diminished in size, and altered in shape. No branches were given off from this portion of the vessel, which, when filled with injection, presented a conical form, tapering downward to a mere point, and terminating in a rounded cord which constituted the remaining part, or the obliterated portion of the artery, and was continued down to the spot where the operation had been performed. The ligature had probably been applied just above the origin of the circumflex and epigastric branches, although no evidence remained to indicate the precise spot. Just above Poupart's ligament the iliac artery became suddenly restored, (apparently by the influx of blood from the branches mentioned above,) and assumed about half its natural size. The obliterated vessel presented the appearance of a continuous unbroken cord, from the cessation of the iliac above to its restoration below. * * * The vessel having regained about half its natural size, passed into the thigh and was continued without receiving any accession from collateral vessels, until it reached the origin of the *profunda;* from which branch the trunk appeared to derive a large quantity of blood, sufficient to restore it to the ordinary extent of calibre which the femoral possesses in a stout muscular limb; the remaining portion of the femoral artery below the *profunda* presented nothing unusual in its appearance, and bore no indication of having received any farther influx of blood through collateral branches. Just above the origin of the *profunda*, the femoral artery had become distorted, and irregular in shape, and was rendered somewhat obscure by its connexion with what appeared to be the remains of the aneurismal sac adhering to the anterior surface of the vessel and gluing it to the adjacent muscles and *fascia*. There can be but little doubt that the original opening of communication between the sac and the femoral trunk had existed at this spot, viz. just above the *profunda* branch; but it would seem equally apparent that, as the aneurismal tumour became obliterated in the progress of the cure after the operation, the opening into the vessel also became closed, while the integrity of the arterial trunk, above and below the sac, was maintained continuous and entire. The collateral circulation had, in this instance been established by the junction of the ilio-lumbar, obturator, gluteal and ischiatic, branches from the internal iliac, with the circumflex and epigastric of the external iliac and the *profunda* of the femoral. They consisted of three sets of communicating vessels which descended respectively over the fore part, the internal side, and the posterior surface of the hip-joint, and may be described as forming a circular *plexus* around the articulation, ramifying among the muscles of that region. * * * The ilio-lumbar, gluteal, and ischiatic arteries are enormously dilated. The internal pudic is also of large size, but it does not appear to furnish any direct communication with the femoral." (p. 48–50.) This preparation is in the Museum of Guy's Hospital.]

1482. If the aneurysm be situated in the lower third of the thigh, or at the knee-joint, it is best to *tie the femoral artery* in the following manner. The pulse of the artery should be followed from the groin downwards, and where it is only indistinctly felt is to be the end of a cut, which begins about two and a half inches below Poupart's ligament, and descends on the inner edge of the *m. sartorius*, in the triangular space formed by the *m. adductor secundus* and *vastus internus*. The skin

(*a*) Guy's Hospital Reports, vol. i. 1836.

and *fascia lata* being divided, and the edge of the *m. sartorius* drawn somewhat outwards, the artery is found enclosed in its cellular sheath, with the femoral vein under it, and the branches of the crural nerve on its outer side. When the artery is properly isolated, the ligature is to be carried round it with the aneurysmal needle (*a*).

John Hunter tied the femoral artery in the lower half of the thigh; dividing the skin and *fascia lata* on the inside of the *m. sartorius* to the extent of three inches, he laid bare the edge of this muscle, isolated the artery lying beneath, and tied it near the place where it passes through the tendon of the *m. adductor* (*b*). If the artery be tied in the upper half of the thigh, he thinks it best done at the inner edge of the *m. sartorius*; and if in the lower half, at the outer edge (*c*), which, after having been laid bare by a cut three inches long, is to be drawn somewhat inwards, where the artery is covered with a slip of *aponeurosis*, passing from the *m. adductor* to the *m. vastus internus*; this must be cut through, and the artery isolated in the way already mentioned.

1483. If an aneurysm be in the ham or on the upper part of the arteries of the leg, there may be sufficient space for tying the artery in the ham: but on account of the depth of the vessel, of the difficulty of its isolation, its nearness to the joint, and so on, this operation is to be considered as by far more dangerous and less safe than that of tying the femoral artery. In aneurysms, tying the femoral artery is to be unconditionally preferred, and only in cases of wound of the popliteal artery is its tying indicated, in which sufficient enlargement of the wound is usually necessary. As for the rest, the popliteal artery has been tied in three different parts, at the *middle*, *upper*, and *lower* part of the ham.

1484. If the artery is to be laid bare *in the middle of the ham*, the patient having been placed on his belly, and the thigh perfectly extended, a cut, three inches long, is to be made a little to the inner side of the mesial line of the ham, through the skin and *aponeurosis*, taking care to avoid the *vena saphena;* the edges of the wound being then separated, the surgeon penetrates deeper with careful cuts, and with the handle of the knife through the cellular tissue, often much loaded with fat, down to the popliteal nerve, vein, or artery itself. The nerve lies on the outer side, and between it and the artery is the vein, which covers the outside of the artery. The nerve should be drawn aside, and the artery separated with the greatest care from the vein, so as to wound neither the articular veins nor arteries. When the needle is to be carried round the artery, the leg must be somewhat bent.

If the artery be tied *in the upper part of the ham*, a cut is to be made somewhat on the inside of the base of the triangular space formed on the inside by the *m. semi-tendinosus* and *semi-membranosus*, and on the outside by the *m. biceps femoris*, to the top of this triangle, the skin and *aponeurosis* are divided, and the rest of the operation performed as in the former case.

In tying the popliteal artery *at the lower part of the ham*, the cut is to be made somewhat on the inside of the mesial line, and some lines below the knee-joint, from three to four inches long, above the hind part of the leg, through the skin, cellular tissue, and *aponeurosis;* the inter-

(*a*) Scarpa, Translation, p. 278.

(*b*) Transactions of a Society for the Improvement of Medical and Surgical Knowledge, vol. i. p. 148.

(*c*) Caillot, above cited, p. 72.—Wegehausen, in Rust's Magazin für die gesammte Heilkunde, vol. ii. p. 408.

space between the two heads of the *m. gastrocnemius* then appearing, these are to be separated, and the trunk of the vessel and the sural branches come into view with the veins and posterior cutaneous nerves of the leg. These parts are to be drawn aside by an assistant, and the cellular tissue being divided with the handle of the knife, the popliteal artery is found on the inner side, the vein in the middle, and the nerve on the outside. If the cut be somewhat lengthened in this proceeding, the posterior tibial artery may be tied at its upper part (*a*).

Jobert (*b*) ties the artery in the internal epicondyloid pit, viz., in the triangular depression bounded within by the *m. sartorius*, *gracilis*, *semi-tendinosus* and *semi-membranosus*. The knee is to be half bent, and a cut made on the outer edge of these muscles, two inches long, through the skin to the fatty tissue. The skin is to be then drawn outwards, and a second cut across the former made, but without wounding the skin, by which the tendinous expansion of the *m. adductor magnus* is divided. The forefinger is to be passed beneath the tendinous expansion, and a button-ended bistoury introduced upon it, to cut through the superficial layer of the *aponeurosis* which covers the artery. The pulsation of the artery is then felt, and in some thin persons may even be seen. The fatty tissue is to be penetrated with a director, which is carried with the greatest care between the artery and vein.

1485. If the aneurysm be situated at the commencement of the tibial artery, the femoral must be tied in the way mentioned (1). But if it be lower on the tibial artery, the inflow of blood, after tying the femoral artery, is sufficient, in large aneurysms of the foot, to keep up the disease, and it is therefore necessary to tie the affected artery in the neighbourhood of the aneurysmal sac (2).

[(1) The following case of aneurysm of the posterior tibial artery is a good example of the practice recommended:—

Case.—M. H., aged 38 years, was admitted,

Sept. 13, 1832, with a pulsating tumour at the back of the upper part of the right leg. He had fallen down stairs a twelvemonth since upon a brush, and at the same time twisted his leg, which laid him up with great pain and swelling for ten days, but after that time he seemed to get well, excepting that he had a little continual pain and always a throbbing behind and below the head of the *fibula*. Six months since, after having walked a considerable distance, his leg began to swell and be so painful as to compel him to keep at rest. There is now distinct pulsation below the head of the fibula and at an opposite point on the inside of the leg beneath the gastrocnemial muscles. The posterior tibial artery does not pulsate at the ankle; and the anterior tibial beats but feebly. The girth of the affected leg at this part is nearly sixteen inches, whilst in the other it is only thirteen and a half inches. The temperature of the limb is diminished; and he has numbness and pricking of the whole limb below the tumour, more particularly affecting the foot. Pressure of the femoral artery at the groin, or on the sides of the swelling, diminishes it half an inch, but it fills immediately, when the pressure is withdrawn.

Sept. 21. My colleague Green tied the femoral artery at the usual place in the middle of the thigh. The pulsation ceased when the ligature was tightened.

Oct. 2. Has been going on well; the limb about an inch smaller, but more yielding: the pricking and numbness of the foot have ceased.

Oct. 30. The ligature came away. After which the wound soon healed; but at two months' end the size of the limb had only diminished an inch.

Astley Cooper mentions a case of "anterior tibial aneurism a little below the head of the fibula, for which the femoral artery was tied; the pulsation ceased in the aneurism, and the swelling for a time subsided. The case did not ultimately recover, for a slough of the aneurismal sac took place." (p. 63.)

(*a*) Bierkowsky, Anatomisch-chirurgische Abbildungen, pl. viii. figs. 1, 2.; pl. x. fig. 3. A, B.—Froriep, R., above cited, pl. xii.—Dietrich, above cited, p. 334.—Manec, above cited, pl. xi.

(*b*) Nouvelle Bibliothèque Médicale, 1827, Feb.

(2) The younger CLINE had a case of aneurysm of the anterior tibial artery "on the upper part of the foot, and he tied the anterior tibial artery at the lower part of the leg, but the pulsation in the aneurism continued when the boy left the hospital." "It will therefore be right," says ASTLEY COOPER, "to tie the artery by opening the sac, so as to secure it above and below the aperture, if the aneurism be seated low down in the limb, as the anastomosis with the plantar arteries is exceedingly free." (p. 63.)]

1486. In *laying bare the anterior tibial artery somewhat above the middle of the leg*, the space between the anterior tibial muscle and the long extensor of the great toe, is to be chosen and the great toe moved whilst the finger is carried outwards from the crest of the shin-bone. The skin and *aponeurosis* of the leg are to be divided for two and a half inches in the direction of this space: then with the finger, or with the handle of the knife, these muscles are separated, and at the depth of an inch the anterior tibial artery is found, with its accompanying single vein and nerve.

In the neighbourhood of the instep the artery is quite superficial, covered by the skin and *aponeurosis* of the leg, between the tendons of the *m. tibialis anticus* and *extensor pollicis longus*. If the dorsal artery of the foot is to be laid bare, a cut is made in the direction of the second toe, on the back of the foot, through the skin and *aponeurosis*, and the artery is found between the tendons of the *m. extensor pollicis* and the first tendon of the *m. extensor brevis digitorum*.

1487. The *exposure of the posterior tibial artery in the middle or in the upper third* of the leg is very difficult, on account of its depth and of the expansion of the *aponeurosis* being tightened by the contraction of the muscles of the calf. A cut is made along the inner edge of the shin-bone, for three or four inches through the skin, and the attachment of the *m. soleus* divided throughout the whole of this extent. The muscle must then be turned a little aside, and the aponeurotic expansion, separating the muscles of the calf into a superficial and deep layer, divided, under which the artery is found, between two veins, and accompanied with the tibial nerve on its fibular side (1). *At its lower part* the posterior tibial artery lies very superficial, and may easily be exposed by a cut, two inches long, between the inner ankle and the ACHILLES' tendon. It lies closer to the heel than the tendons of *m. tibialis posticus*, and *flexor digitorum pedis*, and is surrounded with fat and cellular tissue.

[(1) It will not be out of place here to give a caution as to the treatment of a wound of the posterior tibial artery, by any instrument or other body penetrating from the outside of the leg. I well recollect the case of a man, who whilst mowing in company with others, received the point of the scythe of the labourer next behind him, in the outside of the upper part of his leg. The scythe passed inwards, and wounded the posterior tibial artery, without piercing the skin on the inside of the leg. The wound was freely enlarged, and great pains taken to get at the vessel, but its depth was so great, that after many efforts, the attempt was given up. A cut was then made on the inside of the leg, as above directed, and the vessel reached and tied with great ease. In a similar case, the like practice should be adopted. The only difficulty in the operation consists in forgetting that the artery and deep layer of muscles are overspread with a tight *fascia*, which may possibly be mistaken for the interosseous ligament. The artery cannot be reached till this be opened very freely, as it is very unyielding.—J. F. S.]

1488. If the *peroneal artery be tied* in the minddle of the leg, a cut is to be made from any one part of the outer side of the ACHILLES' tendon,

and carried obliquely upwards and outwards to the hinder outer surface of the splint-bone. The external saphenous vein is to be avoided, the *aponeurosis* divided, and the forefinger, passed before the ACHILLES' tendon, is carried upon it before the muscles of the calf, so as to separate them from the deep layer. The *fascia* covering the deep muscles is to be cut through, and the inner edge of the *m. flexor pollicis* raised upwards and outwards. The artery is found sometimes between the fibres of this muscle, and sometimes between it, the splint-bone, and the interosseous membrane. If the artery be looked for deeper than the middle of the leg, as CHARLES BELL proposes, its hinder branch only is found.

1489. What has been already said about aneurysms on the front and back of the hand, applies also to those on the sole, and on the back of the foot. If here it be not permissible, on account of the position of the aneurysm, to open the sac, and tie the artery above and below, the flow of blood must be prevented by tying the affected artery still higher, and, after opening the sac, it must be completely prevented by pressure. This treatment must also be followed in wounds of arteries on the back of the foot and in the sole (*a*).

1490. When the femoral artery is obliterated at the origin of the *arteria profunda*, the blood passes from the branches of the internal iliac arteries into the circumflex arteries of the thigh, and by the descending branches of the *a. profunda* into the articular arteries, whence it passes into the trunk of the femoral. If the obliteration occur in the lower third, the circulation is kept up, not merely by the anastomosis between the *a. profunda* and the arteries of the knee, but also by many anastomotic or muscular branches. If a part of the popliteal artery, or even the origin of the upper or lower arteries of the knee be obliterated, the blood passes by the anastomosis of the *a. profunda* into the upper, thence into the lower arteries of the knee and from them into the recurrent branches of the tibial arteries.

[The following is ASTLEY COOPER's account (*b*) of the dissection of almost seven years after the femoral artery had been tied for popliteal aneurysm. "The femoral artery which is necessarily obliterated by the ligature, was here converted into a cord, from the origin of the *arteria profunda* down to the ham. The whole of the popliteal artery was also changed into a similar substance; and thus the natural channel of the blood from the groin to the lower part of the knee was entirely destroyed. The muscles therefore which usually receive blood vessels from the femoral artery, as the *sartorius*, *rectus* and *vasti*, had no branches but from the *arteria profunda* and circumflex arteries; and the articular arteries from the popliteal, although they were still capable of receiving blood, derived it, not from the popliteal artery, but from the communicating vessels of the *profunda*. The *arteria profunda* formed the new channel for the blood; considerably enlarged in its diameter, although still not equal in size to the femoral artery at the groin, it took its usual course to the back of the thigh on the inner side of the thigh-bone, and sent branches of a larger size than usual to the flexor muscles of the leg, and just midway on the back of the thigh it began to send off those arteries which became the support of the new circulation. The first artery sent off passed down close to the back of the thigh-bone, and entered the two superior articular branches of the popliteal artery, which vessels supply the upper part of the knee-joint. The second new large vessel arising from the *profunda* at the same part with the former, passed down by the inner side of the *biceps* muscle, to an artery of the popliteal, which was distributed to the *gastrocnemius* muscle. Whilst a third artery dividing into several branches, passed down with

(*a*) SCARPA, p. 225.—ROUX, Nouveaux Elémens de Médecine Opératoire, vol. i. pt. ii. p. 698.
(*b*) Medico-Chir. Trans., vol. ii. 1811.

the sciatic nerve behind the knee-joint, and some of its branches united themselves with the inferior articular arteries of the popliteal, with some recurrent branches of those arteries, which arteries passing to the *gastrocnemii*, and lastly with the origin of the anterior and posterior tibial arteries; and these new large communicating branches were readily distinguished from others by their tortuous course. It appears then that it is those branches of the *profunda* which accompany the sciatic nerve, that are the principal supporters of the new circulation. They were five in number, besides the two deep-seated arteries which do not accompany the nerve. The external circumflex was considerably larger than usual for the supply of branches to the muscles on the fore part of the thigh, but it had no branches for the new circulation. The obturator artery did not appear larger than usual, and although much pains were taken to trace any enlarged communicating branches between the ischiatic arteries and *profunda*, yet no vessels capable of receiving so large an injection could be found." (pp. 254–56.)]

VI.—OF ANEURYSMAL VARIX AND VARICOSE ANEURYSM.

Hunter, Wm., M.D., Medical Observations and Inquiries, vol. i. p. 340, vol. ii. p. 390.

Guattani, De cubiti flexuræ aneurysmatibus; in Lauth's Collectio Scriptorum, &c., p. 203.

Scarpa, above cited, p. 421. Translation.

Hodgson, above cited, p. 496.

Adelmann, P., Tractatus anatomico-chirurgicus de aneurysmate spurio-varicoso. Wirceb., 1821. 4to; with two lithographic plates.

Schottin, Merkwürdiger Fall einer aneurysmatischen Venengeschwulst. Altenburg, 1822.

Breschet, Mémoires chirurgicaux sur différentes espèces d'Anévrysmes. Paris, 1834, p. 98.

1491. If a vein and an artery connected with it be so injured, that by the subsequent adhesion of the edges of the wounded vessels, an immediate communication between the two vessels is produced, it is called an *Aneurysmal Varix* (*Varix aneurysmaticus*, *Aneurysma per transfusionem*. *A. arterioso-venosum.*) It occurs most frequently at the elbow-joint, as consequence of blood-letting; it is, however, also observed in other parts (1).

(1) On the upper arm, by Riecherand, Cloquet, Jaeger; on the radial artery, and cephalic vein, by Schottin; on the subclavian, by Larrey; on the carotid by Larrey and Marc; on the temporal by Bushe and myself; on the femoral artery, by Siebold, Barnes, Dupuytren Breschet; on the popliteal, by Lassus, Sabatier Richerand, Boyer, Larrey, Hodgson; on the external iliac, by Larrey; and on the division of the *aorta* and *vena cava*, by Syme.

[My friend Mackmurdo has very recently had a case of aneurysmal *varix* between the internal jugular vein and carotid artery close to the skull. Its existence was not known prior to death. The man had had scrofulous enlargement of the glands of the neck near the angle of the jaw, which suppurated; a sinous ulcer formed, from which arterial hæmorrhage occurred twice, and Mackmurdo thought it advisable to tie the common carotid artery which arrested the bleeding; but the patient sunk after seven days, and on *examination*, besides large destruction of the bifurcation of the carotid artery and of the internal jugular vein, the aneurysmal *varix*, already mentioned, was found.—J. F. S.]

1492. Aneurysmal *varix* is characterized by a circumscribed swelling of blue colour, and small extent, which is formed by expansion of the vein, and in which a peculiar tremulous motion, and whizzing noise are observed, produced by the overflowing of the blood from the artery into the vein. The swelling is generally, at least at the bend of the arm, not

larger than a nutmeg, (on the femoral and subclavian, it has been seen as large as an egg, and even as big as the fist,) accompanied with varicose swelling of the neighbouring veins; it subsides entirely by pressure, shows less pulsation if the part on which it is situated be raised; but is greater if the part hang down, or if pressure be made upon the vein below this swelling. If the artery be compressed above the swelling, the pulsation at once ceases, but returns directly the pressure is withdrawn. The trunk of the artery above the swelling pulsates more strongly than on the opposite side, and is much distended; below the swelling, the pulsation is weaker, but after long continuance the diameter of the artery also is increased, and the artery often becomes tortuous. The size of the swelling depends on the size of the opening of communication between the artery and vein, though the swelling usually diminishes somewhat; if the neighbouring veins be enlarged, it then increases no more, and no longer causes any particular inconvenience. In other cases, however, it is accompanied with a diminution of the pulse in the lower part of the artery, with a diminution of temperature, sensation, and motion of the parts below the aneurysmal varix, which fall into a state of complete torpor.

Breschet (*a*) has proved, by careful observation and experiment, that in the *systole* the blood flows out of the artery into the vein; and in the *diastole*, out of the vein into the artery; and that, on the latter condition depend, the enlargement of the lower part of the artery, which is often tortuous, and of which, on account of its weaker pulsation, it has been falsely asserted that it is diminished in diameter, as well as the other circumstances and changes of the arterial walls, into a condition similar to that of the veins. By the passage of the arterial blood into the veins, the walls of the latter are thickened, and resemble, in a degree, those of arteries. As in the extremities, the passage of the blood from the vein into the artery takes place more readily than in aneurysmal *varix* on the neck and head; so he explains how the symptoms are milder, and why in the latter, often only during the horizontal position of the head, symptoms as fainting, and the like, occur, they being grounded on the overflow of the blood from the vein into the artery.

[Sennertus (*b*) is first considered to have described aneurysmal *varix;* his description, however, is only a little improvement on Galen's account, already mentioned. (p. 197.) He says:—"The proximate cause of aneurysm is an opening of the internal, with a dilatation of the external coat of an artery. But very commonly it is opened by a wound, when unskilful surgeons open the artery for the vein, or the artery with the vein. Hence, the external coat being softer and more like a vein more readily unites; whilst the interior being harder, remains open, in consequence of which the blood and vital spirits endeavour to escape through the aperture, and so distending the external tunic, this kind of tumour is produced."

Dr. William Hunter, however, in a paper entitled "*The History of an Aneurysm of the Aorta, with some remarks on Aneurysms in general,*" published in 1757 (*c*), first drew the attention of the profession to *aneurysmal varix*. He asks:—"Does it ever happen in Surgery, when an artery is opened through a vein, that a communication of anastomosis is afterwards kept up between these two vessels. It is easy to conceive this case; and it is not long since I was consulted about one, which had all the symptoms that might be expected, supposing such a thing to have actually happened, and such symptoms as otherwise must be allowed to be very unaccountable. In his second paper (*d*) William Hunter says:—"We must suppose that the wound of the skin, and of the adjacent or upper side of the vein, heal up as usual; but that the wound of the artery, and of the adjacent or under side of the

(*a*) Above cited.
(*b*) Opera, vol. iii. book v. chap. xliii. p. 797. Paris, 1641, fol.
(*c*) Med. Obs. and Inquiries, vol. i.
(*d*) Ibid., vol. iv.

vein remain open, (as the wound of the artery does in a spurious aneurysm,) and by that means the blood is thrown from the trunk of the artery directly into a trunk of the vein. Extraordinary as this supposition may appear, in reality it differs from the common spurious aneurysm in one circumstance only, viz., the wound remaining open in the side of the vein, as well as in the side of the artery. But, this one circumstance will occasion a great deal of difference in the symptoms, in the tendency of the complaint, and in the proper mode of treating it: upon which account the knowledge of such a case will be of importance in surgery.

"It will differ in its symptoms from the common spurious aneurysm principally thus. The vein will be dilated or become varicose, and will have a pulsatile jarring motion, on account of the stream from the artery (1). It will make a hissing noise, which will be found to correspond with the pulse for the same reason." (pp. 391, 392.) In the young lady's case, "there was a hissing sound, and a tremulous jarring motion in the veins, which was very remarkable at the part that had been punctured, and became insensible at some distance, both upwards and downwards." (p. 397.) In the porter it is stated:—"There is a remarkable tremulous motion, (as well as a considerable pulsation,) both in the bag and in the dilated vein, as if the blood was squirted into it through a small hole. It is like what is produced in the mouth by continuing the sound of the letter R in a whisper. (p. 403.) This motion is not only felt, and seen distinctly, but heard, too, if the ear be held near the part; and if the ear touches the skin, the sound is much more loud and distinct. It is a hissing noise, as if there was a blast of air through a small hole, and interrupted, answering precisely and constantly to the stroke of the heart, or *diastole* of the artery. * * * The patient is so sensible of the noise, that he often finds it keeps him from falling asleep, when the arm happens to be near his head." (p. 404.)

"The blood of the tumour will be altogether or almost entirely fluid, because kept in constant motion. The artery, I apprehend, will become larger in the arm and smaller at the wrist than it was in the natural state, which will be found out by comparing the size and the pulse of the artery in both arms at these different places," (p. 392); the reasons for which he thus gives:—"Why is the pulse and the wrist so much weaker in the diseased arm than in the other? Surely, the reason is obvious and clear. If the blood can easily escape from the trunk of the artery directly into the trunk of the vein, it is natural to think that it will be driven along the extreme branches with less force, and in less quantity. Whence is it that the artery is enlarged all the way down the arm? I am of opinion, that it is somehow the consequence of the blood passing so readily from the artery into the vein, and that it will always so happen in such cases. That it is not owing to any particular weakness in the coats of the artery, like that in a *true* aneurysm, naturally and constantly tending to rupture, but it has rather such an extension as happens to all arteries in growing bodies, and to the arteries of particular parts, when the parts themselves increase in their bulk, and, at the same time, retain a vascular structure. * * * I presume that the derivation of blood to the arm by the wound of the artery has been the cause of the dilatation of that vessel; and that in the living body an artery will as certainly become *larger*, when the resistance to the blood is taken off, as it will become smaller when it is compressed, or, as it will shrink and become a solid cord when the blood is not allowed to pass through it at all. * * * In order to conceive how or why the trunk of the artery will become larger, in consequence of an immediate and free communication with the trunk of the vein, let us take another view of it, thus:—Suppose that instead of a single aperture, there was a large branch added to the artery of the same diameter as the aperture, and that it ramified in the common way through some adventitious vascular part, a wen, for example, and terminated in corresponding veins, and that these ended in the common trunk of the basilic vein, every body must see, that in this case the trunk of the artery would dilate till it became proportionable in capacity to its branches; for till then the trunk would be the narrowest part of the canal,—the part where there would be the most resistance, and therefore the yielding coats of the artery would give way till the just proportion was established between the trunk and all its branches. These two cases, I apprehend, are similar as to the principal point, but differ in some particulars. In the case of an aperture, the resistance to the blood is diminished; thence it will move with more celerity; the trunk of the artery will be less enlarged, and the branches will shrink a little. But in the case of an additional

branch, the resistance, I presume, would be as great as before; the celerity, therefore, would not be increased, the old branches would continue of the same dimensions, and the trunk would therefore increase still more." (p. 407–411.)

(1) Lawrence (*a*) observes on this point:—"The sensation is almost the same as that which is communicated to the hand by the vibration of the cord of a musical instrument, and it is particularly described by some writers, who call it a rilling noise; some call it a whizzing, and some a vibratory noise. This noise is not only heard in the swollen part of the vein, but it also extends along the course of the vessel up the arm." (p. 166.) Liston (*b*) says:—"On applying the ear close to the tumour, or listening through the stethoscope, the peculiar noise is not only felt, but heard of almost startling intensity, somewhat resembling the noise of complicated and powerful machinery softened and confused by distance." (p. 676.)

Liston relates an excellent instance of aneurysmal *varix* in the femoral vein and artery, consequent on a deep chisel-wound in the lower part of the thigh, which at the time bled profusely, but having been stuffed and compressed, healed in course of eight days." A twelvemonth afterwards, troublesome pulsation was perceived in the part; at the same time, the veins of the leg became varicose, and a succession of ulcers formed on the lower and anterior portion of the limb. The affection attracted little attention till between twelve and thirteen years after, when he observed a considerable swelling in the site of the wound, beating strongly, and the pulsations accompanied with a peculiar thrilling sound and feel—not confined to the tumour, though strongest there, but extending to the groin along the course of the femoral vein, which was evidently much dilated throughout its whole course. Six months after, the tumour was nearly equal to the fist in size, of regular and globular form, pulsating very strongly, and imparting to the hams the peculiar sensation of aneurismal *varix*, remarkably distinct and powerful. The pulsation and thrilling are continued in a less degree to Poupart's ligament, and down to the calf of the leg. * * * He feels little pain, but exercise and exertion of every kind are seriously impeded." (p. 676.) Firm and constant pressure of the swelling, with uniform compression of the whole limb, were employed, and Liston informs me with success. There is at the present time, (April, 1846,) in St. George's Hospital, a case of varicose aneurysm in the thigh resulting from a knife-stab.—J. F. S.

William Hunter also points out the marked distinction between aneurysmal *varix* and false aneurysm. "The natural tendency of such a complaint," says he, "will be very different from that of the spurious aneurysm. The one is growing worse every hour, because of the resistance to the arterial blood; and if not remedied by surgery, must at last burst. The other in a short time comes to a nearly permanent state; and if not disturbed, produces no mischief, because there is no considerable resistance to the blood that is forced out of the artery." (p. 393.) In the first case which he saw, at the end of 14 years, the swelling, nothing having been done to it, was nearly in the same state. The second case, in which the swelling had the size of a large nutmeg, so remained, when seen five years afterwards.]

1493. The *cure* of the aneurysmal *varix* may be in many cases effected by continual compression, which either effects obliteration of the artery, or brings the wall of the vein so into contact that the aperture of the artery is closed. But as this mode of treatment, if the walls of both vessels be not connected, exposes the patient to the danger of a complication with aneurysm, so may it be employed only in recent cases, and in young or thin persons, where the walls of the vessel can be sufficiently compressed, and the patient recommended abstinence from all exertion of the part, when from that evil no farther symptoms are caused (*c*). But if the abovementioned inconveniences of diminished nutrition, sensation, motion, and so on, occur, the operation is indicated, and not indeed, as by many advised, by tying the affected artery above the aneurysmal part, but according

(*a*) Lectures, above cited.
(*b*) Elements of Surgery, part ii. London, 1840.
(*c*) Scarpa, above cited, p. 432.—Breschet, above cited.

to the old method, by cutting into the sac, and applying a ligature round the artery above and below the wounded part (1).

(1) Breschet has, from the above-mentioned causes, proved that the tying of the artery, according to Hunter's plan, in aneurysmal *varix*, which has existed for some time, produces only temporary improvement, but that all the symptoms soon recur, as before the operation, and render tying the artery below the wounded place necessary; as the opening of communication between the artery and vein does not close, and is kept up by the introduced collateral circulation of the previous condition. He also doubts the benefit of simply tying the artery below the wounded part, as recommended by Brasdor.

In an aneurysmal *varix* of the temporal artery, in which, by tying the common carotid artery, I obtained only temporary improvement, Stromeyer produced a radical cure by tying the vein (*a*). He divided the *varix;* at the bottom of the sac found with trouble *a small opening*, into which he introduced a probe. He freely separated the lower part of the much-*expanded vein*, and applied two ligatures around it; a third ligature tied a vein from the *occiput*, which communicated with the sac. After the *bleeding was thus stanched*, the wound was closed with six interrupted stitches.

[The advice which Dr. Hunter gave to the young lady was "to do nothing while there should be no considerable alteration" (p. 398) in the swelling, which she followed with advantage for fourteen years. And in the second case not a hint is given about tying the artery.

Astley Cooper says:—"No operation has been required for this disease, in any case which I have seen of it, as it is not a dangerous state, either to the life, or even to the arm. It renders the arm weaker, and nothing more serious arises from it." (p. 84.)

Atkinson, of York (*b*), however, in a large and increasing size of an aneurysmal *varix*, thought it necessary to take up the brachial artery, but the patient died of mortification.]

1494. If a vein, wounded in the way described, be not in immediate contact with the artery wounded at the same time; or if on account of the oblique position of the wound, or by the compression employed, the blood find no obstruction in flowing into the vein, the cellular tissue which connects the artery and vein expands into an aneurysmal sac by which the two vessels communicate with each other. The vein is somewhat distant from the artery, and the blood flows from the sac into the vein, and thus is formed a *Varicose Aneurysm* (*Aneurysma varicosum.*) In this case the aneurysmal sac enlarges, and, it is to be feared, will burst. Clot forms in the sac, and, together with the tremulous swelling of the vein, is felt a firm pulsating swelling, of defined extent, which, if the artery be compressed above, does not, as in *varix*, subside. The above-described symptoms are also present. Tying the artery above the sac, held by Scarpa (*c*) and Hodgson (*d*) most favourable for the cure, is for the above-mentioned reasons most uncertain on account of the speedy danger of a relapse; and tying above and below the sac is the most proper (*e*).

[William Hunter was also well aware of this form of the disease. He says:—"Another difference in such cases will arise from the different manner in which the orifice of the artery may be united or continued with the orifice of the vein. In one case, the trunk of the vein may keep close to the trunk of the artery, and the very

(*a*) Burckhardt, Achiv. der physiologischen Heilkunde von Roser und Wunderlich, 1843.

(*b*) Cooper's Lectures, vol. ii. p. 84.

(*c*) Above cited, p. 443.

(*d*) Above cited, p. 507.

(*e*) Park, in Medical Facts and Observations, vol. iv. p. 111.—Physick, in Medical Museum, vol. i. p. 65.—Richerand, above cited.—Breschet, above cited.—[Norris, in American Journal of Medical Sciences, vol. v., N. S. 1843.—G. W. N.]

thin *stratum* of cellular membrane between them may, by means of a little inflammation and coagulation of the blood among the filaments, as it were, solder the two orifices of these vessels together, so that there shall be nothing like a canal going from one to the other; and then the whole tumefaction will be more regular, and more evidently a dilatation of the veins only. (Such is the *aneurysmal varix.* J. F. S.) In other instances the blood that rushes from the wounded artery, meeting with some difficulty of admission and passage through the vein, may dilate the cellular membrane between the artery and vein, into a bag, as in a common spurious aneurysm, and so make a sort of canal between these two vessels. The trunk of the vein will then be removed to some distance from the trunk of the artery, and the bag will be situated chiefly upon the under side of the vein. The bag may take on an irregular form, from the cellular membrane being more loose and yielding at one part than at another, and from being unequally bound down by the *fascia* of the *biceps* muscle. (Such is a *varicose aneurysm.* J. F. S.) And if the bag be very large, especially if it be of an irregular figure, no doubt coagulations of blood may be formed, as in the common spurious aneurysm." (pp. 394, 95.)]

In operating on such a varicose aneurysm, when, after the application of a tourniquet, the swelling is cut into throughout its whole length, and the blood absorbed with a sponge, at the bottom of the cavity is seen the aperture made by the lancet, in the hinder wall of the expanded vein. If a probe be introduced into it, it passes into a second sac, but not into the artery, which is ascertained by the ease with which the probe moves around and the difficulty with which it can be carried in the direction of the artery. After the introduction of the probe, this opening is to be enlarged, and the second sac, which is full of coagulated blood and layers of membrane, laid open throughout its whole extent. After emptying and cleaning the sac, the wound of the artery appears in the bottom, through which the sound is to be introduced, and the ligature applied above and below.

[My friend GREEN had some years ago a case of varicose aneurysm, as he considered it, in the frontal branch of the temporal artery and vein, about the size of a walnut, and which resulted from these vessels having been wounded in cupping. The artery entered one end of the sac, but it did not pass out at the other, so that the vein alone had two orifices in it. He removed the whole mass and the preparation is in King's College Museum.

The highly interesting case described by PERRY (*a*) under the name of varicose aneurysm, does not appear to me to correspond at all with the conditions which the term varicose aneurysm generally implies, and in which it is used by both HODGSON and CHELIUS. The former specially observes:—"If the vein be not in immediate contact with the artery, or if the blood meet with obstruction in its passage from one to the other, in consequence of the obliquity of the wound, the employment of compression, or any other cause, the cellular membrane connecting the vein and artery may be dilated into an aneurysmal sac, through which the two vessels will communicate with each other. In this case the vein will be removed to some distance from the artery, and the *aneurismal sac will be situated between the two vessels;* the blood will first pass from the artery into the aneurismal sac, and from the aneurismal sac into the *dilated vein.* This variety of disease may with propriety be denominated *varicose aneurism,* to distinguish it from *aneurismal varix.*" (p. 507.) In PERRY'S case, however, there was nothing of this kind. He says:—"At the spot in the thigh where the communication had been presumed to exist between the artery and vein there was an aneurismal sac about as large as a walnut, firmly ossified within, which, by the pressure it had exerted upon the vein, had caused absorption of its coats, so as to form a circular opening of about two lines in diameter, into which the aneurism had burst; thus inducing a free and persistent communication between the vessels. Just below the aperture, the vein was obliterated at a single point, below which it was again pervious. In all the rest of its course up the thigh it was *diminished in size* and *thickened.*" (p. 42.) From this it will be clearly seen, there was neither

(*a*) Med. Chir. Trans. vol. xx. 1837.

condition of a varicose aneurysm, neither an intermediate sac, nor a dilated vein, but exactly the contrary. Neither was it an aneurysmal *varix*, for there was no special tumour of the vein, nor was it enlarged, but just the contrary, "diminished in size and contracted." If the account of the case be carefully examined, I think it must be admitted that it is none other than a simple case of aneurysm, having the very rare termination of bursting into a vein, just as in the cases already mentioned (*par.* 1402, *note*) where aneurysms of the *aorta* have burst into the pulmonary artery, which in reality belongs to the venous system, as it conveys the spoiled blood to the lungs for purification. That so far as the femoral artery was concerned, it was subject to aneurysm by dilatation cannot be disputed, for PERRY says "the coats of the femoral artery, throughout its whole course, were scarcely, if at all thicker than those of a vein, the attenuation having, as careful dissection afterwards proved, taken place equally in all its coats. Immediately below the origin of the *profunda* the vessel was greatly dilated, having the appearance of an aneurysmal sac. Its coats were here softened and much attenuated, large enough to admit the point of the ring-finger." (pp. 41, 42.) The ossification of the aneurysmal sac at which the artery communicated with the vein has nought to do with the question.—J. F. S.]

B.—UNNATURAL EXPANSION IN THE BRANCHES AND RAMIFICATIONS OF THE ARTERIES.

VON WALTHER, Journal für Chirurgie und Augenheilkund, vol. v. p. 244.
BRESCHET, above cited.

1495. An unnatural expansion of an artery to a greater or less extent, often throughout its whole length, and in its most principal ramifications, with simultaneous lengthening of the vessel, which becomes tortuous, and, with numerous curvings and windings, forms swellings of various size, on many parts presents knotty elevations, or little circumscribed aneurysmal swellings, which sometimes are true sac-like aneurysms, sometimes also mixed aneurysms, with torn internal coat, (BRESCHET,) produces *Branching Aneurysm* (*Aneurysma racemosum*, *A. cirsoideum*, *A. anastomoticum seu anastomosium*, *Varix arterialis*, *Tumour sanguineus arteriosus.*) It occurs most commonly in arteries of the third or fourth order; on the branches of the carotid, labial, temporal, occipital, ophthalmic, and superior thyroidal arteries; on the arteries of the fore-arm and leg; in the arterial arches on the palm and sole; and in the vessels of the *periosteum.*

1496. This aneurysm is characterized by a more or less strong pulsation of the several expanded arteries, and their various arches and branchings and by knotty, soft, livid, pulsating swellings, forming distinct tumours of various size, which lie contiguously in rows, or even upon each other. Every increased congestion of blood by exertion, overheating, and so on, increases the pulsation, which, by compression of the principal trunk, is diminished or entirely stopped, and at the same time the swelling subsides and becomes relaxed. From the various situations of this aneurysm, to wit, on the head, peculiar symptoms may arise; the patient hears violent pulsation, has whizzing and roaring in the head, which disturb him in his sleep; often shooting pain in the course of the arteries; and if the swelling lie on a bone, it is absorbed by the pressure, or groove-like depressions are formed on it in the course of the severally enlarged vessels. With the quicker or slower enlargement of the swelling, the skin thins more and more, and bleedings at last take place sponta-

neously, or from trifling causes, which are often difficult to stanch, are frequently repeated, and cause death.

1497. The branching aneurysm is distinguished from other swellings by the distinct pulsation and the considerable expansion of the arteries to a great extent of their course, and by the pulsation of the compressible swelling. The diseased expansion of the capillary vessels or *Teleangiectasy*, never presents any such pulsation and expansion of single vessels; but both may occur at once, the branching aneurysm may subside into a teleangiectasy, or may be developed from it. Examination of branching aneurysm shows the walls of the expanded arteries thin, soft, and falling together, when cut through like veins, and especially resembling expanded veins. At the situation of the most knotty eminences there are either sac-like expansions of all the thinned arterial coats, or the middle coat is torn and the internal coat protruded with it through this opening under the cellular coat (*a*).

1498. The *causes* of branching aneurysm are either accidental, as wounds of the arteries, contusions, continued irritation, and thereby continued congestion, especially in suppressed ordinary discharges of blood or rheumatic affections. Most commonly there appears to be a general co-operating diathesis; for rarely is the affection confined to one part; mostly a more or less general affection of the arterial system shows itself, especially softening of the arterial walls, which increases in proportion to their expansion. Females of middle age and of delicate bodily frame are most frequently subject to it.

1499. The *prognosis* in branching aneurysm, when it has attained a high degree of development, or when a general *diathesis* exists, is extremely unfavourable. The *treatment* must be directed especially to the origin and seat of the evil. With a defined extent, and when the seat of branching aneurysm is defined, a proportionate and sufficiently great compression with rest, and the local and internal use of astringent remedies, may be sufficient (Breschet.) If the swelling be superficial, for instance, on the face, and the vessels going to it be not expanded to a great extent, they may be extirpated; this, however, is rarely the case, and the extirpation, on account of the severe bleeding, easily becomes dangerous; and in such cases, as well as in a rather large extent of swelling, its simple or manifold tying, as proposed in teleangiectasy, is proper. The simple tying of the swelling and pressure (1) is also applicable, only to a certain extent, but is also accompanied with danger of severe bleeding and irritation, which happen also from the employment of caustics and the actual cautery. Where the vessels leading to the swelling are expanded to a great extent, they, to wit, the temporal, occipital, and other arteries have been severally tied, but their manifold anastomoses have in such cases nearly always soon produced a relapse, even when continued pressure has been kept upon the swelling. Tying the principal trunk, the branches of which are expanded, is in such cases always the most advisable, although experience also shows that even therewith a relapse frequently ensues; in which case the swelling subsides only for a short time, but soon arises again, and increases together with the pulsation caused by the introduced collateral circulation. After tying the princi-

(*a*) Breschet, above cited, pl. ii. fig. 3.

pal trunk it is therefore always advisable to employ a corresponding antiphlogistic treatment, cold applications and pressure (2). If the disease occur on the limbs, and in such degree that the modes of treatment recommended are inapplicable or ineffectual, amputation of the limb is the only remedy, but it rarely has a satisfactory issue.

(1) Graefe, in the largest pulsating swellings, made a long and deep cut, immediately pressed down firmly a large sponge, and, before the blood could escape, quickly applied a soft agaric between the edges of the wound, covered the whole with a sponge an inch thick, and confined it with strips of sticking plaster laid crossways and a circular bandage. The result was favourable.

(2) Travers (*a*), Dalrymple (*b*), and Wardrop (*c*) have, in such aneurysms in the orbit, tied the carotid artery with success, which is accounted for by the smaller and less numerous anastomoses. Rogers (*d*) cured an aneurysm by anastomosis of the external maxillary artery by tying the carotid. On the contrary, Dupuytren (*e*) tied the carotid on account of such swelling situated on the ear and region of the *occiput*, for which compression and tying of the temporal, auricular, and occipital arteries had been performed without success; the swelling diminished, the pulsation ceased, but it returned about the seventeenth day, and continued, only less strong than before, in spite of a compressing apparatus. Mussey (*f*) tied both carotids, on account of such swelling upon the crown of the head, with little benefit, as the pulsation recurred four weeks after the second tying; and in the extirpation which was performed two quarts of blood were lost, and forty vessels tied. With equally various result was the carotid tied. (Dupuytren.) I have seen one case, where the femoral artery was tied without benefit, and amputation of the thigh became necessary.

1500. With branching aneurysm in the soft parts, those swellings which depend on similar diseased changes of the arteries in bones, actually agree, and are therefore distinguished by Breschet as *Aneurysm of the arteries of bones*, and by Scarpa as *Aneurysms by anastomosis of bones.*

Pearson (*g*) communicated the first observations on such swellings, and after him Scarpa (*h*). More recently Lallemand has made known a similar observation; and Breschet (*i*) has added remarks, as well as historical inquiries upon the existence of similar cases in the earlier writers, with several observations by Dupuytren. Scarpa (*j*) also has subjected this disease to a special inquiry.

1501. Frequently, from sudden and undiscernible causes, often a shorter or longer time after the operation of any external violence, more or less severe pain occurs upon some one spot of a bone, most frequently in the neighbourhood of the joint-ends of tubular bones, which, when the patient is quiet, diminishes, or even for a time subsides; but then returns more severely. A swelling appears, the veins of the whole limb swell; the pain spreads over the entire limb, which has a bluish-red colour. *Pulsation* is soon felt in the swelling, which is at first indistinct, but subsequently becomes stronger, and as strong as in aneurysm. This pulsation is synchronous with that of the artery, without a rush, and, if the disease have previously made much progress, with extension of the swelling in

(*a*) Med. Chir. Trans., vol. ii. p. 1.
(*b*) Ibid., vol. vi. p. 111.
(*c*) Ibid., vol. ix. p. 203; and Lancet, vol. xii. p. 267.
(*d*) American Journal of Medical Sciences, vol. xiii. p. 271. 1833.
(*e*) Rust's Magazin, vol. viii. p. 116.—Breschet, above cited, p. 76.
(*f*) London Medical Gazette, vol. vi. p. 76.
(*g*) Medical Communications, vol. ii. London, 1790; p. 95.
(*h*) On Aneurysm above cited, p. 478.
(*i*) Observation sur une Tumeur Aneurismale, accompagnée de circonstances insolites, par M. Lallemand, suivie des observations et des réflexions sur des tumeurs sanguines d'un caractère équivoque, qui paraissent être des Aneursymes des Artères des Os. Paris, 1827. 4to.
(*j*) Annali Universali di Medicina. May, June, 1830.

every direction. Pressure on the principal artery of the limb, between the swelling and the heart, completely stops the pulsation, by which the swelling loses its tension and subsides, but returns immediately the compression of the artery is removed. The patient has often continued pain in the affected part, which is swollen or wasted, and the motions of which are entirely, or only at the joint, in the neighbourhood of which is the swelling, prevented. If the swelling be pressed with the fingers, there is often observed at some parts a crackling, as in squeezing parchment together, or in breaking an egg-shell. If the bone be completely destroyed, the part may be moved in every direction (*a*). If the swelling be developed in the neighbourhood of a large artery, it may most commonly be followed over the swelling.

Nicol (*b*) has communicated a case precisely like mine.

1502. On examining these swellings after death or amputation of the affected part, the principal vessels have been found throughout their whole course unhurt, and neither by injection nor by the closest examination could any trace of disturbance of their continuity be observed. On opening the swelling, the condition of the parts varied according to the different degree of development of the disease. When the bone was entirely destroyed, the aneurysmal sac, of which the walls were very thick, often cartilaginous, and formed of *periosteum*, contained a quantity of fibrous layers, like those commonly found in aneurysmal sacs, and in it the remains of the destroyed bone. The internal surface of this sac was flocky, irregular, very much like that part of the *placenta* connected with the womb, and presents numerous openings of freely branching vessels, from which, if the part be injected, a portion of the injection flows into the sac. In a slighter degree of the disease the external table of the bone was still found, but very thin, destroyed in some places, in others but slightly resisting the pressure of the finger, resembling a cartilaginous plate, which yields to pressure and again rises, or breaks like an egg-shell. The neighbouring joint was always healthy, even when separated from the aneurysmal sac only by the layers of the loosened joint cartilages. The fibrous clot was collected in the cavity of the bone, or the sac presented several cavities filled with it, wherewith every single artery of the sac corresponds. Upon the external surface of the sac the arteries were very numerously expanded and enlarged, and often were so to a tolerable distance around the sac.

1503. These swellings are developed on the various bones of the body, not unfrequently on several bones of one and the same person; on the skull, trunk, and limbs, most frequently on the upper part of the leg, below the knee, on the shin, or splint bone alone, or on both bones at once (Pearson, Lallemand, Dupuytren); but hardly ever in the middle of the long tubular bones.

The *occasional causes* of these swellings are commonly external violence, a kick, blow, fall, or any violent exertion in lifting a heavy weight, and so on, in which the patient feels a crack at the spot where subsequently the disease is developed; the interval, however, between the

(*a*) Chelius, Zur Lehre von den schwammigen Auswüchsen der harten Hirnhaut und de Schadels. Heidelberg, 1831. fol. Erste Beobachtung, p. 43.

(*b*) Edinburgh Medical and Surgical Journal, 1834. July.

operation of such cause and the origin of the disease is very great, and during this time the patient often feels no pain, or only indistinct and transient pain. LALLEMAND observed this disease occur after acute rheumatic swelling of the knees. Ordinarily the swelling has a general internal cause, manifestly corresponding with which is its not unfrequent origin without any distinguishable cause, the simultaneous or subsequent origin of several happening in one and the same subject, and especially the circumstance that the disease even reappears in some parts after amputation of the affected limb. On these grounds such swellings cannot be placed, as they have been by BRESCHET and others, in the same rank with teleangiectasy of the soft parts, which is always a local disease, and so remains, even when of considerable extent, whilst this, on the contrary, is usually connected with a constitutional disease.

1504. These diseased changes in the bones appear always to be preceded by an inflammatory condition, in consequence of which the nourishment of the bone is altered; loosening, softening, and absorption of the hard bony mass, a more rich development and enlargement of the vessels, congestion of blood, and complete destruction of the bone are produced. That these diseased changes proceed from the interior to the exterior of the bone, is admitted by all observers, and the cases in which the external plate of bone has been found similar to a thin fragile shell, prove it. But whether this disease be not also developed from the external surface of the bone and from the *periosteum*, and whether the condition of other organic diseases of bone be not changed by an angiectasic complication, as in these swellings, must be decided by farther examination and observation.

[It must not be supposed that all pulsating tumours in bone are to be referred to the peculiar form of disease now under consideration, for STANLEY (*a*) has shown that "three distinct sources of pulsation in such tumours can be recognised. *First.* The proximity of a large arterial trunk. *Second.* The development of blood vessels and blood cells, constituting a sort of erectile tissue within the tumour. *Third.* Enlargement of the arteries of the bone in which the tumour has originated." (p. 303.) Of the first kind he mentions several examples, in two of which "the tumour occupied the whole circumference of the upper arm in its upper third, and possessed throughout an equal and strong pulsation, which ceased on compressing the subclavian artery above the clavicle. In each case the disease was considered to be an aneurism of the axillary artery." One of these cases was, on *examination*, found to be "an encephaloid tumour originating in the *humerus*, and covered by the articular cartilage of the head of the bone. * * * There were no large vessels distributed through it. In the other case, the tumour originated in the *humerus*, and was composed of a firm gelatinous substance, about half an inch thick, and forming the walls of a large cavity, filled by a serous fluid. * * * In this instance no remarkable disposition of vessels through the tumour was observed. * * * In both these cases the brachial artery was perfectly healthy and with its accompanying veins and nerves was found closely united by cellular tissue to the tumour through its whole extent." In a third case, which was under LAWRENCE's care, and following a fall, "shortly afterwards a painful swelling arose immediately above the knee, and gradually extended around the back part and sides of the lower third of the thigh. Near the tendon of the *biceps*, a softening of the swelling indicated the probability of its containing matter, and accordingly a small puncture was here made into it from which about four ounces of arterial blood freely flowed. On examining the swelling more closely, pulsation in it was now discovered." On consultation it was presumed to be an aneurysm, the femoral artery was therefore tied, the pulsation ceased and the

(*a*) On the Pulsating Tumours of Bone, with the account of a case, &c.; in Med. Chir. Trans., vol. xxviii. 1845.

size of the swelling at first diminished but afterwards it again "enlarged, became painful, and the skin covering it sloughed, the sloughing extended deeply into the tumour, but was unaccompanied by hæmorrhage. * * * He shortly afterwards sunk from exhaustion." On *examination*, "the tumour was found to consist of a compound of soft fibrous and dense osseous tissue, the latter situated deeply, and extending around the *femur*, in which it appeared to have originated. The whole series of femoral, inguinal, and lumbar absorbent glands were converted into osseous tumours. The femoral and popliteal arteries were sound. In the lower part of the thigh, the femoral artery was a little compressed and displaced by the ossified absorbing glands which were closely united to it." (p. 304–6.) Under this head STANLEY mentions two cases of HODGSON's, of encephaloid tumours in the *tibia* just above the inner ankle, of which HODGSON observes:—"To what these tumours owed their pulsation I know not, but I thought it was derived from contiguous arteries." Also a case of LAWRENCE's (*a*) of "medullary tumour developed in the head of the *tibia*, attended at one period with pulsation and suppression of the pulse in the anterior and posterior tibial arteries at the ankle. In the account of the examination of the limb, Mr. LAWRENCE states that the medullary tumour had protruded from the bone just at the division of the popliteal artery, and the passage of the anterior tibial through the interosseous ligament," which "circumstance accounts for the pulsation felt in the tumour at an early period; for the suppression of the pulse in the tibial arteries when the morbid growth was confined by the *fascia* of the leg, and its subsequent return when the progress of the swelling through the *fascia* had liberated the arteries from pressure." STANLEY also refers to a case of GUTHRIE's (*b*), in which there was a tumour on the *nates* as large as an adult's head, which was considered to be an aneurysm; "the pulsation was decidedly manifest in every part; and, on putting the ear to it, the whizzing sound attendant on the flowing of blood into an aneurism could be very distinctly heard. * * * The ligature of the common iliac was followed by a diminution of the tumour to the extent of one half, and the recovery from the operation was complete. Five months afterwards the tumour again enlarged, and she gradually sunk. On *examination* the tumour was found to be composed of cerebriform substance. The arteries were healthy." Of the *second* kind, was STANLEY's own case:—"The pulsating tumour originated in the *ilium*, it was soft, spongy, and dark-coloured, with cells dispersed through it, each about the size of a pea, and filled with blood. Bunches of convoluted vessels were drawn out of this spongy substance, and, when macerated, this substance was reduced to a tissue closely resembling that of a swelled spleen or *placenta*. Here was a structure capable of enlargement by the distension of its vessels and cells; and, assuming these to have been directly continuous with the arterial system, it may be added, that the rush of blood into such a structure would give to the whole mass a pulsation resembling that of aneurism; at all events, it is certain that this tumour did possess such pulsation, which ceased directly the *aorta* was compressed through the abdominal parietes; moreover, that the tumour enlarged and became tense when the femoral artery below it was compressed, as an aneurism, under similar circumstances, would have done." Similar to this, is the case given to STANLEY by the younger LAWRENCE, of Brighton, in which the tumour in the right groin having "gradually increased to the size of an egg, was then observed to pulsate, after which it rapidly increased. The pulsation continued, was uniform over the whole tumour, and accompanied by a distinct bruit." The man died, and, on *examination*, the tumour was found to consist "of vessels intermixed with soft gelatinous substance. The vessels formed more than half the tumour, were about the size of sewing thread, and very convoluted; and were directly continuous with the arterial system." (pp. 309, 310.) The *third* form is the disease which BRESCHET and SCARPA here refer to, and with the cases which they have given must be included LUKE's case, which STANLEY relates, in which a man of 20 years broke his thigh; "at the end of seven weeks it was firmly united. A month afterwards, by a second accident, the bone was again broken at the same place. Reunion of the fracture ensued, but very slowly and unevenly. A tumour now formed in the situation of the injury; it was hard in some parts, soft and elastic in others. A grooved needle was introduced into it, and a jet of blood followed. The tumour increased to the size of a large melon, became very

(*a*) Observations on Tumours; in Med. Chir. Trans., vol. xvii. p. 39. 1832.

(*b*) London Medical and Surgical Journal, vol. v. p. 831, 1843; and vol. vi. p. 101, 1835.

painful, and pulsation in it was now discovered. Suspicion of its being an aneurism in consequence arose, and in consultation it was determined to tie the femoral artery; this was done with the effect of stopping the pulsation of the tumour, and producing a diminution in it to the extent of an inch in its circumference. About a month afterwards the tumour again enlarged, but without the return of pulsation, and it was now deemed right to amputate the limb. The surface of the stump bled so profusely, that more than 40 ligatures were required. The medullary artery was greatly enlarged, and threw out a forcible jet of blood. The man left the hospital with the stump healed, and in every respect well. On *examining* the limb, the lower third of the *femur* was found expanded into a spherical tumour, in the interior of which were cells of varying size, some of the largest about an inch in diameter, and filled with blood. The femoral and popliteal artery were entire and healthy." (pp. 311, 312.) Although STANLEY places this case among the third kind of pulsating tumours, yet it seems, from the history, that it has greater resemblance to the second.

From the recital of these cases, one important point immediately attracts attention, which is, the absence of any peculiar character by which either form of swelling could be distinguished from aneurysm, for which they seem to have been almost universally mistaken.—J. F. S.]

1505. In *treating* this disease, in some cases applications of various kinds, leeches, rubbing in, mercurial treatment in presumed syphilitic diseases, and so on, have been employed, but without any result. Only can a strict and sufficiently long continued antiphlogistic treatment, with attention to the general causes standing in somewhat causal relation, perhaps prevent the development of this disease. If the swelling have already acquired a certain stage, according to our present experience, *tying* the principal arterial trunk, or *amputation* (if the situation of the disease permit) can alone effect a cure.

[NORRIS, in American Journal of the Med. Sciences, vol. xxv. p. 283. 1839.—G. W. N.]

1506. Tying the principal trunk of the artery gives the more hope, according as it is undertaken early, even before considerable destruction of the bone has taken place. LALLEMAND'S case proves that a permanent cure may be effected; but when the diseased change in the bone has so far advanced, only temporary diminution of the swelling and removal of the aneurysmal symptoms are effected, whilst the *disease* of the bone continues spreading, as shown by DUPUYTREN'S (*a*) case, in which, seven years after the femoral artery had been tied for such swelling at the upper part of the shin-bone, amputation was required, as, without the reappearance of any aneurysmal symptoms, it had attained an enormous size. In all cases where the destruction of the bone has already far advanced, amputation can only be considered as a means of deliverance; it must not, however, be herein overlooked that with existing constitutional disease, even after the operation, without any cause, the disease may be set up again, as shown in SCARPA'S (*b*) first case, in which, five years after amputation, during which time the patient's health was good, the disease, without any cause, again showed itself on the stump of the thigh-bone.

(*a*) BRESCHET, above cited, p. 15. (*b*) Above cited, p. 483.

C.—UNNATURAL EXPANSION IN THE CAPILLARY-VASCULAR SYSTEM.

Bell, J., Principles of Surgery, vol. ii. p. 456. On the Aneurysma per anastomosin.

Graefe, C. F., De notione et curâ angiectaseos labiorum. Lipsiæ, 1807. 4to.

Ibid., Angiektasie ein Beitrag zur rationellen Kur und Erkenntniss der Gefässausdehnungen. Leipz., 1808. 4to; with copper-plates.

Richerand, Nosographie Chirurgicale, vol. iv. p. 120.

Hodgson, above cited, p. 441.

Roux, Relation d'un Voyage fait à Londres en 1814; on Parallèle de la Chirurgie anglaise avec la Chirurgie française. Paris, 1815, p. 211.

Maunoir, J. P., Mémoire sur les Fongus medullaire et hématode. Paris and Geneva, 1820. 8vo.

von Walther, Ueber Verhärtung, Scirrhus, harten und weichen Krebs, Medullarsarcom, Blutschwamm, Teleangiektasie, und Aneurysma per Anastomosin; in Journal für Chirurgie und Augenheilkunde, vol. v. p. 189.

[Watson, I., On the Nature and treatment of Teleangiectasis in the American Journal of the Medical Sciences, vol. xxiv. 1839.—G. W. N.]

1507. By the unnatural expansion of the capillary vessels are produced soft elastic swellings, which, consisting merely of numerous vessels tortuous and connected together with loose cellular tissue, can in respect to their internal structure, be compared with nothing better than the *placenta*. The different designations, *Fungus hæmatodes*, *Tumor fungosus sanguineus*, *Aneurysma per anastomosin*, *Aneurysma spongiosum*, *Blutschwamm*, *Teleangiektasie*, *Tumeur érectile*, *Splenoide* have been applied to them.

I consider *teleangiectasy* the best of all these designations. The term *bloody fungus* (*Fungus hæmatodes*) I employ here, *but not in the sense of* Hey *and others, who thereby designate another degeneration*, for which I consider the term *Fungus medullaris* more appropriate; at least, I cannot, after numerous examinations, admit (as Walther does) any other *Fungus hæmatodes* besides teleangiectasy and medullary fungus.

1508. These swellings, which originally have their seat in the skin and underlying cellular tissue, occur either in children or adults, or are congenital. It generally begins with a red or bluish spot, which at first is little or not at all elevated above the skin, and increases in a shorter or longer time to a variously shaped swelling, in which the patient feels a peculiar crawling and beating, which on closer examination may be more or less distinctly perceived. The colour of the swelling is sometimes more red, sometimes more bluish; it enlarges and pulsates more distinctly at every exertion, by which the circulation of the blood is quickened. When it has attained a great extent, single fluctuating spots arise, the skin thins, bursts, and considerable bleeding ensues, which frequently recurs. The apertures often close with a seemingly firm scar; and often red, fungous granulations spring up from them, which consist merely of clotted blood. The interior of such swelling exhibits a convolution of innumerable vessels enveloped in loose cellular tissue, many cavities filled with blood, and frequently single vessels full of holes, out of which the blood trickles. If these swellings exist in the cellular tissue beneath the skin, the latter retains its natural condition for a longer time; a deceptive sensation of fluctation is felt; the skin is gradually altered in

the way mentioned; the disease rarely extends between the deep-lying organs. Swellings of this kind may be very easily mistaken for *fungus medullaris*.

The fungous growths, after the bursting of teleangiectasy, result from clotted blood and considerable developement of the *parenchyma* of the swelling; but there never exists in them any specific degeneration (a transition into *fungus hæmatodes*, according to WALTHER's opinion) if no definite general dyscrasy be present. I have seen many bursten and fungous teleangiectasies, but never any extension to a distant organ, as in medullary *fungus*. Also in this degree, if teleangiectasies arise after local diseases, they especially affect the constitution by repeated loss of blood. Upon this, also, depend the favourable results produced by suppuration and scarring, as also the circumstance that bursten teleangiectasies are often closed by a tough scar.

1509. These swellings originate in an unnatural extension, and certainly also in a large development of the capillary vessels; but since these must be considered as the terminations of the arterial, and the commencement of the venous system, we find in such swellings both, but sometimes the arterial, sometimes rather the venous side of the capillary-vascular system affected. This difference manifests itself by the appearance of the swelling, and the circumstances accompanying its development. In teleangiectasy, which affects rather the arterial side of the capillary system, the redness is brighter, the pulsation more distinct, and the enlargement more rapid; but in the venous blood-*fungus* the redness is more dull, bluish, the pulsation less, frequently not at all perceptible, and the growth slower.

JAEGER's assertion, that teleangiectasy, never exhibits pulsation, and that this is only the case when it is accompanied with *Aneurysma anastomosium*, is incorrect. Certainly, it never is perceived in flat though extensive teleangiectasy, but it certainly is, when it has risen up to actual *swelling*, and especially in great agitation of the vascular system, when the crawling pulsation is perceptible even to the patient himself.

1510. Besides the considerable ramification and development of the vessels, various changes may also arise in such swellings from thickening and degeneration of the uninjectable part of their cellular tissue, whereby the swelling varies more or less (1) from that above described. Teleangiectasy may also, especially by continued irritation, be accompanied with *aneurysma anastomosium*, if situated where there are numerous arterial ramifications and anastomoses. Teleangiectasy then increases more rapidly, stronger pulsation is felt in the neighbouring branching arteries, and the pulsation in the swelling itself even, is greater. (*par.* 1496.)

(1) I have seen one such teleangiectasy between the thumb and metacarpal bone of the forefinger, as a dusky red swelling, expanding at certain parts into thin blood sacs, with crawling pulsation, additional swelling, and redness in hanging down of the hand, in diminution of these appearances on raising the fore-arm, or compressing its vessels or the swelling itself with the fingers, in which the sac felt as if full of wool. I applied to it the name of *Teleangiectasis lipomatodes*. Tying the radial artery diminished the extent, and all the other appearances of the swelling (*a*).

1511. The causes of this disease are obscure. It occurs at all ages, and in all constitutions, though most commonly in young subjects of flabby habit, in children, and women. It is developed in all organs,

(*a*) Heidelberg Med. Annalen, vol. i. p. 101. pl. iv.

but especially on the upper part of the body, in the skin of the skull, of the cheeks, of the eyelids, and on the lips. A contusion frequently gives rise to it.

I must deny von Walther's assertion that teleangiectasy must be always congenital, because that peculiar vascular development, and alteration of the injectable part of the substance of the organ, which happens in teleangiectasy, cannot arise at a later period of life, if it be not a vice of the first formation during the embryonic state, although unapparent; for I have often seen teleangiectasy, commence and be developed in the skin of adults, without any preceding trace; but in such instances the progress will be, for manifest reasons, always exceedingly slow.

1512. Teleangiectasy is throughout a local disease, and the *prognosis* is guided by the nature and condition of the swelling, by its seat, and origin, by the age and constitution of the person affected with it. The congenital red spot often enlarges very quickly after birth, often later; but its enlargement is always to be dreaded at the period of puberty, when even the swelling, whose growth is already determined, at that time acquires increased extent. Bleeding has also been observed from such swellings at the time of menstruation. These teleangiectasies have, however, a spontaneous retrocession, and are capable of cure, as I have observed, at different periods of time, in congenital teleangiectasy; and even frequently in those cases in which, from the pale red colour, a quicker enlargement is to be feared. When this occurs, the colour becomes paler; instead of the uniform redness, single vessels appear, between which the skin gradually acquires its natural condition, and the vessels shrink, so that no trace of the disease remains.

1513. The *cure* of teleangiectasy may be effected by *compression*, by *removal* either by *extirpation* or *tying*, by *destruction* with *caustic* or with the *actual cautery*, by exciting a *pretty violent inflammation and suppuration*, and by *tying the principal trunk of the artery*, with the branches of which the swelling is connected. The choice and preference of the several modes of treatment depend on the condition and seat of the disease, and we must be especially careful in the selection of these, that the teleangiectasic tissue be capable of sufficient inflammation and suppuration, and that the scar thereby produced can be converted into a tough tissue, with obliteration of the vessels, without it being necessary to destroy or remove it entirely.

1514. *Compression* of teleangiectasy, either alone or in connexion, at the same time with astringent remedies or cold, can only be employed in a slight degree of the complaint, in congenital red spots, if their seat permit it, with some degree of success (*a*). I have, however, from this mode of treatment, frequently as I have tried it, never obtained any satisfactory result.

Abernethy (*b*) recommends pressure, and if this be inapplicable, the application of cold rose water and alum. I have instituted several experiments with kreosote, but have never observed the slightest result (*c*). Compression has been used, according to the different seat of the disease, with flat plates and stirrup-shaped compressors, and even with plaster of Paris.

1515. *Extirpation of teleangiectasy* with the knife, is always accompanied with more or less considerable bleeding; as, if the patient be

(*a*) Roux, above cited, p. 248.
(*b*) Surgical Works, vol. ii. p. 228.
(*c*) Heidelberg Med. Annalen, vol. i. pt. i.

young, and the seat of the disease such that it is not possible to complete the operation quickly, the danger may be eminent and even fatal. Every thing depends on the cut which is carried round the swelling being made at sufficient distance from it in the healthy parts, as otherwise, on account of the very numerous and largely-distended vessels, severe bleeding ensues; and if a part of the swelling be left, its recurrence is to be feared. If it be requisite to leave part of the swelling, the actual cautery must be applied, or caustics with subsequent pressure, in order to cause destruction, and at the same time to stanch the bleeding. After extirpation, the wound is to be treated according to the general rules. This treatment is often tedious, because frequently no satisfactory suppuration ensues, and the edges of the wound long continue loose. In large and flat teleangiectasies, therefore extirpation can never be employed, but especially only in those which are elevated and have a narrow base.

I have known two instances in which children died upon the operating table in extirpating a teleangiectasy from the face; and, at least in one of the cases, no one could doubt the capability of the highly-distinguished operator.

1516. *Tying a teleangiectasy* has always this great advantage over extirpation, that nothing is to be feared from bleeding. Its employment is specially applicable to projecting swellings with narrow base; but even in the large and out-spreading teleangiectasies, which are prominent, this mode may, according to White (*a*), Lawrence (*b*), and Brodie (*c*) be employed with the best result, as also has happened to me in several cases. Lawrence penetrates the base of the swelling with a strong, slightly curved needle, carrying a double thread, which is firmly tied on both sides. As soon as the mass of the swelling blackens, it may be cut off with the knife, and the ligature removed. Brodie thrusts a hare-lip needle through the swelling a quarter of an inch from its edge, and a straight needle with a double thread at a right angle with this needle and beneath it; the double ligature is then separated, and each tied under the first needle.

[I prefer Brodie's method with the two needles, as thereby the whole base of the swelling is more completely included within the thread. If the swelling be large, it will not be possible, at once, to compress it with the ligature, so as to stop the circulation and cause sloughing. In such case it is better to take hold of the middle of the tumour, and having lifted up and squeezed it, so as to empty out the blood, to pass a needle, armed with double thread through its base. The threads are then to be carefully separated, and each pair of ends being carried round the half bases of the tumour, are tied firmly on opposite sides, and then attached to Graefe's little screw tourniquet, a most excellent instrument for the purpose, with which, as the threads, ulcerating the skin, become loose, they are to be every day or two tightened, till the strangulation and mortification of the swelling is effected. In this way I operated, six years ago, on a child, twelve months old, who had teleangiectasies on the temple and ear. She was born with one, about the size of a sixpence, and bright-coloured, on the temple, just above the auricle, which soon became sore, and occasionally exuding a few drops of blood. In the course of nine months, it acquired the size of half-a-crown. When the child was about six months old, two other little ones, about as large as a pins head, were noticed on the ear, one on the back of the *helix*, and the other on that of the *concha*. All continued growing, but were flat and distinct from each other for the next three months, when they began to rise above the skin, having previously been flat, and soon ran into one another, form-

(*a*) Medic-Chir. Trans., vol. xiii. pt. ii. p. 444.
(*b*) Ibid., p. 420.
(*c*) Ibid., vol. xv. pt. i.

ing one mass. The principal and most elevated portion was on the head, immediately above the auricle, extending back to the occipital bone, as large as a crown piece, and gradually rising towards the centre, which was half an inch above the surface of the skin. From the lower part it continued on the auricle, covering the top of the *concha*, spreading over the upper part of the *helix*, and turning round upon the front of the ear, as low as the *tragus*. The pulsation in the temporal portion was very distinct; the vessels could be easily emptied by pressure, but immediately on its removal the tumour resumed its usual size, and swelled out when the child cried. Its colour was bright scarlet, and it had the feel of a mass of small vessels, or rather that of a sponge. The temporal portion was operated on, as I have advised; but although the ligatures were tightly drawn, strangulation could not be effected; the bright colour remained, and the tumour swelled when the child cried; GRAEFE's screw was attached, and the threads drawn as tight as possible, but without change. On the *third* day, serum freely oozed from the surface; and on the day following the ligatures were hidden, but with scarcely any appearance of having cut into the base, and the bright colour remained. The screws were tightened but no change followed. On the *seventh* day, the ligatures had begun to cut through, and there was a free discharge from the track, but the granulations of the skin were inosculating with the under surface of the tumour, which seemed hardly at all separated. On the *eleventh* day, the screws were again tightened, but without producing any change in the appearance of the swelling. On the following day the hinder ligature came away, but no part of the tumour separated with it; a piece of lint was gently insinuated beneath it. On the *thirteenth* day, the whole swelling appeared about to fall off; it was a little shrunk, but the bright red colour still remained. On the *sixteenth* day, it came off, leaving a granulating surface which slowly healed and contracted. The child was at this time taken into the country, with the promise of bringing her back again, to have the remaining part on the auricle, which thrust it away from the head, and turned it down at right angle, operated on; but I regret that she never returned. So far, however, as it went, the operation was completely successful.—J. F. S.]

1517. The *destruction of teleangiectasy by caustic* is, in all cases, to be considered as the most proper, where the swelling is broad and superficial, especially in children, as here extirpation with the knife is accompanied with difficulty, and speedy danger of imminent bleeding; and often, on account of the seat of the disease and the delicacy of the child, can be as little relied on as the ligature. The most proper caustic is caustic potash, applied as a paste in an aperture of sticking plaster, put on around the teleangiectasy, or smeared over the part to be destroyed, for the purpose of making a slough of sufficient thickness and size, and then covered with sticking plaster. When the slough is thrown off by suppuration, it is to be treated simply as a suppurating part; healing follows with a corresponding scarcely perceptible scar. In very much spreading teleangiectasy, if on the first cauterization, the disease be not entirely destroyed, and shows itself afresh, I have never noticed its quicker spreading, and it is always cured by repeated cauterization. In adults, I have also employed HELLMUND's remedies for destroying teleangiectasy with the best result; it must, however, be recommended for children always with great caution, as, in its extensive application the possibility of absorption of the arsenic is not to be denied (*a*). The application of caustic potash is especially efficient in congenital teleangiectasy, which appear as little superficial red spots in the skin, by which they may be certainly removed, as every other treatment is declined by the parents on account of the inconsiderable appearance of the disease.

(*a*) Heidelberg, klinische Annalen, vol. iv. p. 499, vol. iii. p. 331.

The application of caustic potash is, on every account, to be preferred to the actual cautery.

[I have not had much opportunity of watching the result of this practice, as I always either remove a teleangiectasy with a ligature or the knife; but from the few instances I witnessed, I am not inclined to hold so high an opinion of it as does Chelius. In one case, especially, in which a great part of the *scrotum* of a child was affected with this disease, the application of muriatic acid, to produce constriction of the vascular mass, had only the effect of exciting irritation and hastening the growth, so that it soon acquired the bulk of an orange. It was then removed by a double ligature, excepting a very small portion, which occupied six weeks, as the ligature was not kept tight. Caustic potash was then applied over the whole granulating surface, after which the sore was allowed to heal; but the vessels were soon again found to enlarge, as well as the little portion of the swelling which had been left. The muriatic acid was again applied, but as unsuccessfully as before, and was followed by abscess of the healing of which the swelling soon re-acquired the size of an orange. And occasionally bled. I unfortunately lost sight of the case, so that I know not how it terminated, but it was quite evident the use of acid in this way was fruitless.

I certainly would not on any account apply caustic to produce an eschar in cases of this kind, and of large size; as sloughing in children, when once set up, is not always controllable and often dangerous; and a small tumour can be removed with greater readiness, and with less pain, by ligature or the knife, than by caustic. —J. F. S.]

1518. *For the production of a sufficiently violent inflammation and suppuration, to consolidate the tissue of the teleangiectasy and convert it into a mass of scar*, various remedies have been employed. *First*, the frequently repeated and slight touching the teleangiectasy from its circumference towards its centre with caustic potash; by which, after every falling off of the thin slough, suppuration is kept up for a longer time. *Second*, in children who have not been yet vaccinated, the introduction of the cow-pock into the teleangiectasy; several slight punctures are to be made into it and its neighbourhood with a lancet moistened with lymph, and at regular distances apart. If there be bleeding, some lymph is to be at once introduced into the wound with a lancet, and even some folds of linen, steeped in the lymph, applied to the teleangiectasy. Vesicles form in the ordinary manner, and after the slough falls off, the teleangiectasy has ceased (*a*). Similar to this treatment is the application of the *ung. seu emplastr. tartari stibiati* (Hickmann;) after the production of pustules, poultices are to be applied, and after the separation of the slough, the parts are to be touched with lunar caustic, and bound up with sticking plaster. *Third*, the practice recommended by Marshall Hall (*b*), of piercing with a fine needle through the whole of the mass of the teleangiectasy, close to the sound part, and its repetition in from eight to ten different directions. The punctured canals heal and the tissue is thereby changed. Where possible, pressure may still be employed, but it has no particular effect. *Fourth*, according to Lallemand (*c*), cutting into or cutting out a piece of the teleangiectasy, and uniting the edges of the wound with the twisted suture, or the introduction of long and thick needles through the swelling, which are not, how-

(*a*) Hodgson; in Med. Chir. Review, vol. vii. p. 280.—Lancet, vol. xii. p. 760.—Young; in Glasgow Med. Journal, vol. i. p. 93.—Downing; in Lancet, vol. ii. p. 237.

(*b*) London Med. Gazette, vol. vii. p. 677.—Lancet, 1834. April.

(*c*) Archives générales de Médecine. May, 1815.

ever, used for twisting round the thread, but their points only bent up, and the part defended with a proper covering. When the needles have suppurated out, if the swelling still continue they must be introduced again. We need not be uneasy at the bluish, almost brackish, appearance of the swelling immediately after the introduction of the needles; it is a good sign that the inflammation will attain sufficient height. A frequent repetition of the lunar caustic is necessary; perhaps the application of nitrate of silver is better. *Fifth*, the introduction of a seton by means of a needle, through the teleangiectasy, by which the bleeding from the needle-stab is stanched, and by it remaining in a proper degree of inflammation, suppuration is produced (*a*). If the latter do not occur, some irritating injection should be thrown into the puncture, as LLOYD (*b*) has recommended, without the previous introduction of a seton. The advantage of this, as well also of HALL'S practice is that the skin upon the swelling is preserved and a smaller scar made. Of these different modes of treatment, which are especially employed in flat and spreading teleangiectasy, I must, after considerable experience, give the preference to the cauterization which I have proposed (1).

(1) In a case of teleangiectasy spreading over the whole right side of the face, and nearly over the entire upper lip, and which at several parts, especially on the upper lip, was very puffy and prominent, after all other means had been quite useless, I entirely removed it, and converted it into a smooth mass of scar by very frequently repeated cauterization with nitrate of silver, by which the upper lip was at the same time brought back to its natural thickness.

[PATTISON (*c*), of New York, in a case of teleangiectasy as big as a pigeon's egg, on the shoulder of an infant eleven months old, varied HALL'S operation, by passing "needles made red hot with a spirit-lamp, in rapid succession, about twenty times, into the tumour in all directions. There was no hæmorrhage, and the child apparently suffered little pain. The operation was repeated twice afterwards, after intervals of a week, and in the course of a month the tumour had entirely sloughed away, and the part healed without a vestige of the diseased structure being left."

SMITH (*d*), of Baltimore, recommends the introduction of threads soaked in a solution of lunar caustic, and dried at the fire, by a needle passed through the base of the tumour at different parts.

TYRRELL was in the habit of injecting these teleangiectasies with strong solution of alum, first making a puncture with a lancet, and then inserting an ANEL'S syringe. The operation generally required repetition two or three times; after each of which the swelling became more and more solid, and subsequently shrunk away. No inflammation of consequence ensued.—J. F. S.]

1519. If the seat and extent of the teleangiectasy admit neither of the prescribed treatments, or if they be employed without benefit, or if expansion of the anastomosing branches of the arteries exist at the same time with the teleangiectasy, the final remedy is tying the principal trunk of the arteries with which the swelling is connected, and if this be insufficient in teleangiectasy of the extremities, amputation of the affected part must be performed. It is always advisable to apply a ligature before proceeding to amputation, as the latter can always be done if the former fail and the swelling increase, after the vessel has been tied, by the col-

(*a*) FAWDINGTON; in North of England Medical and Surgical Journal, vol. i. p. 66.—MACILWAIN; in Medic.-Chir. Trans., vol. xviii. p. 189.

(*b*) London Medical Gazette, October, 1836.

(*c*) London and Edinburgh Monthly Journal of Med. Science, 1842, p. 552.

(*d*) American Journal of Med. Science, vol. vi. p. 260, 1843.

lateral circulation; it is therefore of the utmost importance to apply the ligature as near as possible to the swelling. In extensive teleangiectasy on the head, experience shows that tying the common trunk of the carotid artery even on both sides, has rarely permanent result.

Besides the early-mentioned cases of tying the carotid artery on one and both sides, (*par.* 1436,) and in branching aneurysm, (*par.* 1200,) compare also the case of a very large teleangiectasy on the ear, in which tying the carotid artery produced only momentary benefit (*a*). Mott in a child of three years old obtained only imperfect result from tying the carotid artery, and subsequently tied the carotid on the other side. Möller, in a child of four years old, tied both carotids with success (*b*.) I knew a case, where in very extensive teleangiectasy of the ear and its neighbourhood, tying both carotids, continued pressure and deep cuts which were successively made in the sound skin in the neighbourhood of the swelling, to produce a satisfactory scar, had no permanent result.

When Jaeger (*c*) asserts that amputation in simple teleangiectasy is never necessary, and that where undertaken it would not succeed on account of *fungus*, I must deny this assertion. Teleangiectasy is of itself able, without branching aneurysm or other degeneration, to attain so frightful an extent, that no other means than amputation remains. I have seen one case in which a teleangiectasy showed itself after birth, as a small red spot in the middle of the upper arm, and in six months the frightful spreading had reached over the whole arm, from the elbow up to the shoulder and shoulder-blade; but the parents of the child would not decide on permitting any thing to be done for it. In the case of an extensive teleangiectasy on the knee, which I formerly mentioned, where tying the femoral artery was unsuccessful, amputation was the only means of restoring the patient.

The *Tattooing* of moles on the skin, proposed by Pauli, has yet to be mentioned. The part should be washed with soap and water, and rubbed till the blood is introduced into the most delicate branches of the erectile tissue; the skin is then made tight, and covered with colour similar to the natural colour of the skin, which is formed of white lead and carmine. Three needles, sunk into a cork pad so that their points project, are then thrust into the skin, and their points from time to time dipped in the paint. In extensive spots we must proceed gradually, so as not to produce too great swelling. The most difficult part is the choice of colour corresponding to that of the skin.

(*a*) von Walther, above cited, p. 241. (*b*) Jaeger, Handwörterbuch, vol. i. p. 497.
(*c*) Above cited, p. 298.

D.—OF UNNATURAL EXPANSION OF THE VEINS.

Of Varices.

I.—OF VARICES IN GENERAL.

Desault, Œuvres Chirurgicales, vol. ii.
Petit, Traité des Maladies Chirurgicales, vol. ii.
Volpi, Saggio di Osservazioni e di Esperienze Medico-Chirurgiche, &c. Miliana et Pavia, 1814–16. 8vo. vol. ii.
Velpeau, Leçons Orales de Clinique Chirurgicale. Paris, 18 .
Hodgson Joseph, On Diseases of Arteries and Veins above cited.
Brodie, Observations on the Treatment of Varicose Veins of the Leg; in Med.-Chir. Trans., vol. vii. p. 195.
——, Lectures illustrative of various subjects in Pathology and Surgery. 8vo. London, 1846.
Bell, Charles, System of Operative Surgery. London, 1807–9. 8vo. Vol. i. p. 89.
[Watson, John, On the Pathology and Treatment of Varices; in the American Journal of the Medical Sciences. Vol. 5, N. S. 1843.—G. W. N.]

1520. The veins are, on account of the weakness of their membranes, subject to a great degree of sensibility, and then form swellings which are called *Vein-knots* (*Varices*, Lat.; *Blutaderknoten*, *Krampfadern*, Germ.; *Varices*, Fr.)

1521. Expansion of the veins generally takes place very slowly, and at first is not accompanied with any inconvenience; it gradually increases, the veins describe, in their course, larger curves, form unequal, defined, bluish or blackish prominences, which diminish on the application of pressure, but quickly return on its withdrawal, and cause a sensation of weight, and often severe pain in the part where it is situated. Varicose veins by their lying together, often produce large swellings and *œdema* of the whole part: the coats of the veins thicken, adhere to the neighbouring parts; the skin covering them inflames, abscesses form, ulcerations also take place in the skin, and cellular tissue, (varicose ulcers,) which are closely connected with this varicose state, and so long as it continues cannot readily be induced to heal (1). Often by bursting of the vein considerable bleeding ensues; and sometimes the blood is poured into the cellular tissue by tearing of the vein. Often the blood coagulates in the expanded vessel, and the knots thereby produced are hard and incompressible (2). For the most part only the superficial, more rarely the deep-seated veins, in many cases not only the venous trunks, but also the minute branches, sometimes they alone, are expanded, and considerable swellings arise here and there.

[(1) Brodie says:—"For the most part, the effect of inflammation of a varicose cluster is not to produce either abscess or ulcer. It is very remarkable that the blood in inflamed varicose veins coagulates; and they become choked up with the coagu-

lum. There seems to be something in an inflamed vein that is unfavourable to the fluidity of the blood which it contains. You observe this not only when varicose veins of the leg are inflamed, but when the veins are inflamed under other circumstances, as in a case of piles. A patient comes to you with an external pile, which is large and very tender—it is inflamed. At first it contains fluid blood, but in a day or two it becomes filled with solid matter, and if you slit it open you find a solid lump of dark-coloured fibrine. If you slit open an inflamed varicose cluster in the leg, under these circumstances, you will also find that the cavity is filled up in like manner with coagulated blood. * * * The coagulum fills up the vein, and the vein becomes obliterated. Other varicose clusters may appear afterwards, but this one is cured. * * * By degrees the inflammation subsides; the coagulum becomes gradually absorbed; as the absorption proceeds, the sides of the vein approximate, and it assumes the appearance of a narrow cord. In old cases of varicose veins, you will frequently find the skin becomes affected with a chronic inflammation; that is, it will look red, and be very irritable and tender. Sometimes the cuticle is, as it were, abraded, and an ichorous discharge takes place from the red *cutis*. Occasionally the whole of the skin of the leg is in this condition. In other cases there is a chronic inflammation of the cellular membrane. There is an effusion of serum into it, and the limb becomes œdematous. * * * These inflammations are analogous to what we meet with in other cases of venous congestion. But in some instances you find inflammation taking place of a different kind in the cellular membrane, immediately surrounding the varicose cluster. The cellular membrane becomes infiltrated with coagulated lymph, so that the varicose cluster is, as it were, imbedded in a mass of solid substance. At first you would suppose that these veins are obliterated, but they are not so. The lymph which has been deposited becomes organized, and the coats of the vessel thickened, but they remain pervious nevertheless, containing fluid blood, which may be perceived with the finger, flowing freely through the gristly mass. Where there is this deposit of lymph in the cellular membrane round the vein, the skin becomes inflamed near it, and this may give rise to a troublesome ulcer. The more usual history of a varicose ulcer, however, is as follows:—the skin is distended at some point, and a scab forms upon it. When the scab comes off there is an ulcer and the ulcer spreads. The varicose ulcer in most instances begins about the inner ankle, but it may occur in other parts of the leg. * * * Such ulcers are inclined to assume an oval form, the long diameter of the oval extending in the course of the vein upwards and downwards. They are generally nearly on a level with the surrounding skin. The surface of them is dark-coloured, when the patient is erect, and when the small veins are filled with blood; but when the patient lies down it becomes florid; the change taking place very speedily from dark to florid and from florid to dark. The skin and the margin of the ulcer are generally of a dingy-red colour and partly deprived of the cuticle, so that it is often difficult to say where the latter terminates and the ulcer begins. Varicose ulcers are generally very irritable and painful. If the patient be very much upon his feet, they assume a foul and sloughy appearance, and not infrequently are disposed to bleed." (pp. 165–168.)

(2) Hodgson (*a*) says correctly:—"The deposition does not in general fill the vessel, but, by diminishing its calibre, it retards the flow of blood, and causes the dilatation to increase in the inferior portion of the vein, and in the branches which opened into it. Petit, who had observed this circumstance (*b*), was accustomed to open varicose veins, and draw out the string of coagulum. By removing this cause of obstruction, not only the increase of the disease was prevented, but the dilated vessels frequently diminished after the operation. Sometimes, however, the coagulum accumulates to such an extent as completely to obliterate the canal of the dilated vessel. "I have seen," says Hodgson, "four cases in which this event terminated in the spontaneous cure of *varices*." (p. 541.)]

1522. The *cause* of varix is every hindrance to the flow of blood in the veins, as pressure and constriction, with continued flow of blood from the arteries, increased venosity, pressure of the gravid womb, costiveness, peculiar direction and position of the body, for instance, the erect posture and so on (1). Sometimes varix occurs without any per-

(*a*) Above cited. (*b*) Above cited, p. 41, p. 63.

ceptible hindrance to the circulation in different parts of the body, and seems to depend on weakness of the venous coats. Varices mostly show themselves where under natural circumstances the return of the blood is somewhat difficult therefore especially in the lower limbs (2), in the veins of the rectum and spermatic cord. The expansion of the veins is closely connected with the constitutional relations of the patient and certain diseased conditions, so that in a manner it operates favourably, and belongs to the well-being of the patient.

[(1) Dr. Baille (*a*) mentions a case of obliteration of the *vena cava inferior*, "which was found to be changed into a ligamentous substance, from the entrance of the emulgent veins even to the right auricle of the heart. The cavity here was so entirely obliterated, as not only to prevent all circulation of blood through this part of the vein, but even in a great measure to prevent the admission of air by inflation. * * * The blood being prevented from passing through the *vena cava inferior*, flowed into the lumbar veins, enlarging them gradually, as that vein became contracted, till they were of sufficient size to receive the whole blood which returns by the *vena cava*. * * * The enlarged veins were in some places thrown into *varices*, as must naturally take place under the circumstances we have mentioned. (pp. 127, 28.)

Brodie (*b*) says he has seen varicose veins of the fore-arm to a considerable extent. There had been inflammation of the median-cephalic and cephalic veins. These had become obliterated, and in consequence of their obliteration, the blood did not easily return from the fore-arm, so that the veins became varicose." (p. 159.)

Scarpa (*c*) observes:—"The celebrated Mr. Cline having found in the body of a man, the *inferior vena cava* obliterated a little above its bifurcation, in consequence of a steatomatous tumour, which had formed in the cellular tissue behind the *peritonæum*, and which occupied a part of the pelvis and lumbar region, remarked that the epigastric veins were become as large as the little finger, and that the superficial veins of the *abdomen*, as well as the lumbar, and those of the internal cavity of the *abdomen*, were in a similar manner very much dilated; the internal mammary vein likewise greatly enlarged, and also the epigastric, with which it anastamosed, opened, as usual, into the *superior cava*, near to the origin of the subclavian veins; by which circumstance the venous blood of the lower extremities was poured into the *superior cava*, by means of the mammary vein, and into the *inferior cava* by the lumbar veins above the compression caused by the steatomatous tumour." (p. 21, *note*.)

Brodie relates the case of "a man who had varicose veins all down the right arm, and to a considerable extent down the right side of the chest. He had difficulty of breathing, and cough. One day he felt as if he had received a blow on one side of the chest, and immediately a large abscess presented itself externally, as big as an orange, which had evidently made its way from the inside of the chest through one of the intercostal spaces. Immediately upon the appearance of this swelling, the varicose veins disappeared. The man died, and on *examining* the body after death, it was found that there was disease in the bronchial glands; suppuration had taken place in them, and a large abscess had been confined in the inside of the chest, which pressed on the right subclavian vein, and this caused the blood to stagnate in the veins in which it had its origin, and which had in consequence become varicose." In another case, "the superficial veins of the chest and upper extremities were extensively varicose. * * * On *examining* the body, a large medullary tumour was discovered within the chest, which by its pressure on the lower part of the *trachea*, and on the junction of the two subclavian veins, had obstructed at once the entrance of air into the lungs, and the return of the blood to the *superior vena cava*." (pp. 159, 160.)

(2) Generally speaking, the superficial veins are most prone to become varicose, and specially those of the lower limbs. Hodgson says:—"The only instance of *varix*,

(*a*) Of uncommon appearances of Disease in Blood-vessels; in Trans. Med. and Chir., vol. i. 1793.

(*b*) Above cited.

(*c*) On Aneurysm (Translation.)

in the upper arm with which he was acquainted, is mentioned by Petit (*a*); it was situated at the bend of the arm, and the patient was so fat that no other vein could be found for the purpose of venesection, which operation Petit repeatedly performed by puncturing this *varix*." (p. 539.)

Brodie's cases just mentioned are also examples, though from different cause.

Velpeau says he has seen in two persons the arms, fore-arms, and hands covered with varicose swellings; also a mass of *varices* as big as the fist, between the angle of the jaw and the right clavicle, in a young man; a *varix* as large as the thumb under the edge of the orbit in a girl; and a pretty large one, in a man, upon the course of the sagittal suture, which seemed to come from the longitudinal sinus. And he mentions another, as big as the thumb, beneath the tongue. (p. 420)

But the deep veins also occasionally are so affected, as in the instance just cited even within the great cavities of the trunk. I have also very recently seen in St. Thomas's Hospital, a varicose enlargement of the femoral vein, immediately below Poupart's ligament, as big as half a pigeon's egg, and in the seat of femoral rupture, for which it might have been easily mistaken. Hodgson also says:—Mr. Cline described in his lectures the case of a woman who had a large pulsating tumour in her neck, which burst, and proved fatal by hæmorrhage. A sac proceeded from the internal jugular vein. The carotid artery was lodged in a groove at the posterior part of this sac." (p. 539.) I have no doubt that this is the brief history of a preparation in the Museum at St. Thomas's, which precisely corresponds with the account.—J. F. S.]

1523. The *cure* of varix first requires the removal of the cause which hinders the circulation in the veins; and this done it frequently disappears of itself. Obstruction in the bowels must be got rid of, the mode of living properly regulated, continual standing, and the like, forbidden. The most proper remedy, if after the removal of the causes the knots do not subside, or if they depend on local weakness, is the suitable compression of the whole part with bandages, the effect of which is assisted by the employment at the same time of strengthening contracting remedies. A radical cure thereby is rarely effected, for when the comdression is removed, the swellings of the veins, *œdema* and varicose ulcers return.

[Brodie says:—"In many cases where the disease is limited, you may apply merely a partial bandage of adhesive plaster, which will answer the purpose perfectly, giving the patient scarcely any inconvenience. There being, for example, only two or three varicose clusters of small size, you need not trouble the patient with a complete bandage for the whole leg. * * * Having marked the place, (whilst the patient stands erect,) let him recline with the foot raised so that it may be the most elevated part of the whole body. Then, the *varix* having been thus completely emptied, apply one of the pieces of adhesive plaster (three or four inches long, and an inch or an inch and a half wide) across the varicose vessels, and afterwards apply the others in the same manner, drawing up the skin under them, and taking care that the plaster is not thrown into folds. The plasters being applied in this manner, and being strained on the skin beneath, prevent the vein from becoming distended when the patient stands erect." (p. 169.) If the skin be irritated by the resin in the adhesive plaster, he recommends instead *emp. thur. comp.* with a little soap cerate, or soap plaster spread on *amadou*. "In those cases, however, in which the veins of the leg are extensively varicose, this partial compression will not be sufficient, and you must apply a bandage for the whole leg." (p. 170.) Calico, flannel, or stocking-web roller; the Indian rubber web confines too much heat, and does not, in most instances, afford sufficient support to the weak vessels. Laced stockings, either of nankeen, Indian rubber cloth, or spiral wire are sometimes used, but the latter two are objectionable, on account of the heat.

If the varicose veins become inflamed, the patient should be kept in bed in the recumbent posture, have cold lotions applied, and his bowels freely opened; and occasionally it may be necessary to employ leeches, on the use of which Brodie

(*a*) Traité des Maladies Chirurg., vol. ii. p. 49.

gives the following very pertinent advice:—"Do not apply them immediately over the veins; they should be applied higher up on the leg, on the sound skin. The bite of a leech over an inflamed vein will give the patient a good deal of pain, and the little wound will be difficult to heal. If you apply the leeches on the sound skin on the thigh, or the upper part of the leg, you will relieve the varicose veins just as much as if you had applied them on the veins themselves, without giving the patient pain at the time, or trouble afterwards." (p. 173.)]

1524. In order to effect a *radical cure* of varices by closure with a clot of blood, and by obliteration of the vein, various remedies have from the earliest times been proposed. *First*, puncture; *second*, incision; *third*, extirpation; *fourth*, tying; *fifth*, cutting through; *sixth*, application of caustic; *seventh*, piercing with needles or threads; *eighth*, lateral compression of the veins.

According to Gottschalk (*a*), the destruction of a vein never produces a radical cure; on the contrary, the especial cause of varicosity, to wit, a slow circulation in the veins, is farther increased; hence there results from tying a venous trunk *œdema* of the limb, and aggravation of the disease, in addition to the danger of tying the vein. Support of all the veins by simultaneous compression is the true mode of cure, and there is nothing more proper for this than a paste roller. A moist roller is first applied, and then smeared with paste, and over it a second paste roller. The moisture cools the limb pleasantly, and the regular pressure removes all the weight depending on expansion of the veins.

1525. *Puncture of the varix* with a lancet (anciently proposed by Hippocrates) must especially be employed in varices largely filled with coagulated blood, as well also as in those which are very painful, inflamed and much expanded; and, after the removal of the blood, pressure, together with cold applications and the horizontal posture are to be employed.

1526. In cases of larger size and greater extent, the skin and the vein must be *cut into*, by an incision two inches long, upon the largest knot, the escaping blood kept back with the finger, the cavity of the vein plugged with sponge or lint introduced into it, and the bleeding stanched by the application of compresses and circular bandages. If the varicose expansion be only on the leg, one cut is sufficient; if it extend to the middle of the thigh, one cut is to be made above the ankle, a second close above the knee, and if the whole thigh be affected, a third cut is to be made at equal distance. The limb is then to be bandaged, and cold applications to it used for some days. Inflammation takes place in the vein which so spreads from the principal to the other varix, that a greater degree of plasticity arises in them, and the neighbouring varices disappear (*b*).

1527. In some very prominent knots; or even in swellings formed by the agglomeration of various veins, *extirpation*, (*cirsotomia*,) originally proposed by Celsus, has been practised. In the separate knots, the skin, if moveable, should be cut through in a single fold, so that the cut may reach from above to below, over the knot, which is then to be raised with the hook, separated, and cut off above and below. If the skin be adherent, it must be taken away as well as the knot. In the same manner the large swellings are to be treated, and the divided vein tied at its

(*a*) Oppenheim's Zeitschrift für die gesammte Medicin, vol. xxii. pt. ii.

(*b*) Graefe, in his Introduction to C. Bell's Surgery.

upper and lower end; or, if the position permit it, the bleeding is to be stanched by pressure (*a*).

1528. *Tying* (proposed anciently by Aetius and Paulus Ægineta) is to be performed in varix of the lower extremity, on the principal trunk of the saphenous vein, above the swollen part, which is to be laid bare by a suitable cut through the skin, freed from cellular tissue, and the ligature carried round it with a probe; after which, pressure is to be kept up in the horizontal posture (*b*). Ricord (*c*) removes the subcutaneous connexion of the vein, lifts up the vein in a fold of the skin, and thrusts a suture needle, armed with a double thread, through the skin behind the vein, then lets go the vein, without leaving hold of the skin, and carries the needle back through the same holes reversed above the vein, so that the vessel is caught in a subcutaneous loop, both ends of which being held together at the same wound in the skin, are tied on a piece of elastic bougie as in the quill suture. In a similar way, but with two loops, the subcutaneous tying may be performed, according to Tavignot's method. (*par.* 1432.)

[The practice of tying the saphenous vein was revived by Sir Everard Home, for varicose veins of the leg, either with or without ulcers; and he stated (*d*), "that in the course of a week after the operation, the veins in general were very much diminished in size; and in all the cases the ulcers put on a much more healthy appearance in less than three days after the operation; and from that time, where no circumstance occurred to prevent it, went on healing like ulcers in healthy parts." (p. 330.) It, however, happened after this statement, that several patients died from inflammation of the vein following the ligature; and I recollect being present at an operation of this kind, after which the patient became extremely ill and delirious; and, though she recovered of the operation, lost her senses, and was obliged to be placed in a madhouse. These results put a stop to this dangerous practice, vaunted as it had been by Home; and there are, I apprehend, few persons who would now venture on performing it.—J. F. S.]

1529. Solera practised *cutting through the vein above and below the knot*, above the knee and low on the leg; he made a longitudinal cut by the side of the vein, cut through the vein, and prevented its union by the introduction of lint. Brodie (*e*) makes the subcutaneous division of the vein, but he thrusts a narrow, very pointed, slightly-curved bistoury, flat on the side of the vein, between it and the skin, and, in withdrawing it, cuts through the vein without wounding the skin. The bleeding is stanched by pressure.

[In reference to the sub-cutaneous division of varicose veins, Brodie observes:—"Although there may be danger from operations on the *vena saphena*, we have no right to expect danger from operations on its smaller branches" (p. 188); and it was upon these he formerly operated. "With my present experience," he, however, observes, "it really appears to me that, in ordinary cases, it is not worth the patient's while to submit to it, as I always observed that, if I cured one cluster, two smaller ones appeared, one on each side, and that, ultimately, I left the patient no better than I found him. The operation, however, is proper where there is a varicose cluster much distended, and liable to burst and bleed. Here you may actually save the patient's life by having recourse to it; and you may do so without con-

(*a*) Boyer, Traité des Maladies Chirurgicales, vol. ii.

(*b*) C. Bell, above cited, p. 91.—Hodgson, above cited, p. 550.—Moulinie, J.

(*c*) Du Traitement des Varices par la Ligature sous-cutanée des Veines; in Bullet. général de Thérapeutique. July, 1839.

(*d*) Practical Observations on Ulcers. Second Edit. 8vo. 1801.

(*e*) Above cited.

sidering whether fresh clusters are or are not likely to form afterwards." (pp. 189, 90.)]

1530. The *application of the actual cautery* (according to CELSUS, upon the knot laid bare by a cut through the skin) and the *destruction of the skin and the knot with caustic potash* (PARE, BRODIE) have been given up on account of the obstinate ulcers to which they gave rise (1); but the employment of caustic potash is again recommended by BONNET (*a*) and LAUGIER (*b*). BONNET at the same time employs the introduction of needles after DAVAT'S method, and the latter applied the caustic upon the vein, after laying it bare with a cut through the skin. VON FRORIEP overlays very large expanded veins of the lower extremity with compresses, moistened with concentrated, not smoking nitric acid, till the skin becomes erysipelatous, and the swelling firm and painful, and repeats it, after the subsidence of these symptoms, till the cure.

[(1) MAYO (*c*) has also recommended the use of caustic potash, or a caustic paste on the sub-cutaneous venous trunks of the leg in cases of *varix*. "The vein," he says, "is often tender during several days, for the extent of three or four inches above the place at which the caustic is applied. The obstructed part does not exceed more than half an inch to an inch in length. I have never known acute *phlebitis* supervene in employing this practice." (p. 433.) BRODIE, however, is now entirely opposed to it; he says:—"The application of the caustic potash was very painful; the slough took a long time to separate; the sore took a long time to heal; and where one cluster was cured, other clusters appeared. Altogether it was a very tedious process, and my own experience does not lead me to recommend it." (p. 187.)]

1531. The *introduction of needles through the walls of a vein* produces either only slight irritation of the vein, and the formation of a clot, which fills its area, and finally causes its obliteration; or, with a less degree of irritation of the opposite points of the internal coat of the vein, and their simultaneous contact, produces its obliteration. In the *first* proceeding a pin (an insect-pin) is to be carried transversely *through* the vein, and left there for from two to six days with rest, and corresponding dietetic treatment of the patient. On the second day swelling around the pin begins, which is caused partially by the clot formed in the vein, partially by the slight inflammatory process set up in, and around it. The swelling increases on the following days, becomes at the wound, more rarely throughout its whole extent, of a pale rosy-red colour, and at the same time the vessel, as well as its neighbourhood, without pain on pressure, feels more compact. The earlier this appearance sets in, the sooner may the pin be removed. With small veins one pin is sufficient; but in the larger it is better to introduce two or three, in which case the one brings the front, the other the hind wall of the vessel nearer together, and the third is thrust through the middle of the vein. Experience is strongly in favour of the symptoms ensuing, and of the results arising from this mode of treatment (*d*). In the *second* proceeding, a pin is to be thrust transversely *under* the vein, which is to be raised up by it, so that a second pin may be thrust *through it twice*, in the longitudinal direction. With this object a second pin generally straight or curved, round or flattened, is introduced through the skin and vein, about a line below the place

(*a*) Archives générales de Médecine. June, 1839.
(*b*) Bulletin Chirurgical. August, 1839.
(*c*) Outlines of Human Pathology.
(*d*) KUH, C., Die Heilung der Blutader-Erweiterungen durch Acupunctur. Breslau, 1838.

where the transverse pin cuts the axis of the vessels, carried upwards beneath that pin, and thrust from within outwards through the vein and skin—the two pins, forming a cross, are to be surrounded with a thread. One pin may be also thrust transversely through the skin and vein, and a thread twisted round it, like a figure of ∞. The pin is to be left till it have excited inflammation (about five days.) The little fistulous wound soon heals. This mode of treatment should be preferred before all the rest, on account of its slightness, of its less pain and danger, and the certainty of the cure (*a*). Experience, however, shows that wide and deep-spreading phlegmonous inflammation, with fever, redness of the tongue, sooty colour of the teeth, irritation of the mucous membrane of the stomach, swelling of the inguinal glands, extensive suppuration, and even death may ensue from this practice (*b*). According to Franc (*c*), the pin should be thrust through the skin near the vein, carried behind it, thrust out at the other side, and a thread wound around it. Two days are sufficient to produce complete obliteration of the vein (1). Fricke (*d*) introduces, with a moderately strong needle, one, and, in great varicosity, several threads dipped in oil through the vein, and ties the ends upon the skin in a bow. In from twenty-four to thirty-six hours the threads are to be removed, the patient kept quiet, without any dressing, and, on the appearance of inflammation, cold water or lead wash are to be applied.

[(1) Velpeau (*e*) says, that he "never saw, in more than one hundred cases in which he had performed his operation, any troublesome symptom; a slightly spreading external *phlebitis*, some little phlegmonous swellings, and small abscesses, were nearly all the consequences. Often pleasing myself," says he, "with my continual success, you may judge what fear I had of it coming to an end. Unfortunately, at last it came." A patient was operated on by him on *April* 4, 1839, two of the pins were removed on the *sixth*, and the other two, with the ligatures, on the following day, the tied parts being scarred, and the patient free from pain. On the *eleventh* night, however, he was attacked with intermitting shiverings accompanied with nausea and vomiting; and on the following morning the leg was red and swollen, which extended next day up the thigh, and where the ligatures had been applied the skin assumed a violet-colour, and livid spots appeared on different parts of the body; he became delirious, had continued tremors, and weak quick pulse. On the *fourteenth* day the face had become purple, the lips dry, and he was very comatose: large and distinct spots appeared on the inside of the arms, and the hands were swollen and bluish; the whole of the limb which had been operated on was enormously swollen; the extremities became cold, and he died the same morning. The only important points in the *examination* were the fluidity of the blood, and the enormous distention of the *vena cava;* incipient ulceration in the intestines: the vein which had been tied had not been perfectly obliterated. (pp. 442, 43.)]

1532. *Lateral compression of the vein* (according to Breschet's practice in *Varicocele*) has been performed by Sanson (*f*) by means of forceps, between which a pair of metal plates, fifteen lines long, covered with leather, which compressed the vein, raised up in a fold of skin sufficiently to prevent the blood circulating through it. The forceps are to

(*a*) Davat, Thèse, De l'Oblitération des Veines. Paris, 1833; in Archives générales de Médecine. May, 1833.—Du Traitement curatif des Varices par l'Obliteration des Veines à l'aide d'un Point de Suture temporaire. Paris, 1836.

(*b*) Dufreise, in Journal Hebdomad. 1836, p. 265.—Landouzy, H., Du Varicocèle, et en particulier de la cure radicale de cette affection. Paris, 1838. 8vo.

(*c*) Journal des Connaissances Medico-Chirurgicales. 1835. July.—Velpeau, in Révue Médicale, July, 1838.—Melwin, in London Med. Gazette, Oct. 1838.—Uppi, in Annali Univers. di Medic., 1837, Nov., Dec.

(*d*) Medicinische Zeitung. Berlin, Aug. 1833. Hamburg. Zeitsch, vol. i. pt. i. p. 12.

(*e*) Leçons Orales.

(*f*) Gazette Médicale, 1836. Feb. Hamburg. Zeitsch., vol. ii. pt. ii. p. 250.—Froriep's Chirurgisch. Kupfertaf., pl. ccclxxxvi.

be frequently applied at different places, so that no slough should be formed. A plug of blood is thus produced, which stops up the vein.

1533. In reviewing these different modes of treatment for the radical cure of *varix*, it must be remembered that in all those accompanied with wound of the vein, there is danger of venous inflammation arising, which often spreads widely and causes death. This is the more important, as persons who are subject to varix have, for the most part, accompanying gouty or rheumatic affections, stoppage, and fulness in the belly, and extensive alterations in the venous system at the same time, whence they are the more disposed to such inflammations; so that it must not be overlooked that, on account of the causal relations of *varix* to such general diseased condition, it often belongs to the relative well-being of the patient, and that after its removal other symptoms set in, or expansions in other parts of the venous system occur. Such radical cure of *varix* must therefore never be undertaken without careful review of the patient's general condition, and never without important reason, and pressing demand. In old persons it has never any benefit. Puncture is least dangerous; but, in regard to its result, a radical cure, very uncertain. Tying and incision most frequently set up dangerous inflammation; less so do extirpation and the introduction of threads. But even in the latter seemingly trifling proceeding, inflammation of a very severe degree may ensue, though less after the simple introduction of the needle or thread, (Kuh, Fricke,) than in tying the vein at the same time, (Davat, Franc, and others,) in which the circulation through it is entirely arrested. In this respect the simple compression of the vein, after Sanson's plan, deserves especial notice, if farther observation should prove the certain closure of the vein thereby.

II.—OF VARICOCELE.

(*Varicocele*, *Cirsocele*. Lat.; *Krampfaderbruch*, *Saamenaderbruch*, *Saamenadergeschwülst*, Germ.; *Varicocèle*, Fr.)

Richter, Observationes chirurgicæ, fasc. ii. p. 22.
Ibid., Anfangsgründe der Wundarzneikunde, vol. vi. p. 165.
Murray *resp.* Bonsdore, Dissert. de cirsocele. Upsal, 1784.
Leo, F., Dissert. de cirsocele. Landish, 1826.
Benedict, Ueber Hydrocele, Sarcocele und Varicocele. Leipzig, 1831.
Landouzy, above cited.
Fritschi, J., Ueber die Radicalkur der Phlebectasia spermatica interna oder sogenn. Varicocele, u. s. w. Freiburg, 1839.

1534. *Varicocele* or *Cirsocele* is a varicose expansion of the veins of the spermatic cord, and in a more advanced state of those also of the *epididymis* and testicle. The disease always commences in the spermatic cord, and generally makes itself known by a heavy, often smart pain, which from time to time darts to the testicle and loins; the ailment, however, frequently developes itself without any inconvenience. An irregular swelling, consisting of several threads, is felt along the course of the spermatic cord, which diminishes on slight compression. In proportion as the swelling gradually increases, it approaches nearer the testicle, which enlarges, and becomes heavier; by degrees the varicose condition extends to the *epididymis*, and thence to the testicle itself, which is loosened into a soft, doughy mass, and presents only a convo-

lution of expanded vessels, probably simultaneous thickening of their walls, and of the cellular tissue connecting them. The purse also is expanded, and the patient feels a troublesome or painful weight in the testicle, which sensation extends to the loins, especially when it has existed a long time. The characteristic signs of *varicocele* are the ready disappearance of the swelling on compression, its quick reappearance when the pressure is withdrawn, as well as its increase on long-continued standing. As these appearances belong to ruptures, and as in a large *varicocele* the swelling enters the abdominal ring, by which it is enclosed, and its condition, when touched, has resemblance to that of omental rupture, the history of the disease, and the characters already described (*par.* 1200) must give the *diagnosis*.

The words *cirsocele* and *varicocele* are used with different significations. Many writers apply the former only to a simple swelling of the superficial veins of the purse; but the second to a swelling of the spermatic veins. Some employ *varicocele* in this double acceptation, and *cirsocele* as a swelling of the vessels of the *epididymis* and testicle: again, others consider both designations as of similar import.

According to Breschet (*a*) *spermatocele* is a swelling of the spermatic cord, and especially of the *epididymis*, depending on retention of the *semen*. It begins with a sensation of pressure, distention, and more or less severe pain. If the *semen* be not voided by pollution or by connexion, inflammation, bursting of the swelling, and actual fistula ensues, which is characterized by the escape of the *semen* (1). This affection of the *epididymis* is especially observed in *gonorrhœa*, and the swelling of the testicle ensuing in proportion to the decrease and entire cessation of the *gonorrhœa*, which always begins in the *epididymis*, depends on the retention of the *semen*. In this spermatocele, connexion, moderate living, avoidance of exciting the imagination, cold washes to the generative organs, and, in inflammation, the application of leeches are to be recommended. In fistula nothing can be done directly.

[(1) Spermatocele is often a sore nuisance to young people; the testicle become so exceedingly tender that the mere pressure of the dress upon it causes great pain. It is not generally accompanied, at least in the cases I have seen, with much swelling and I have never seen it followed by suppuration, as Breschet states. But I have known it recur very frequently, at intervals of two or three months, for as many years, between sixteen and two or three and twenty. I do not believe it will have usually the results stated; but it is a most troublesome and annoying complaint, compelling the patient to keep himself completely at rest, and is not very easily controlable. Keeping the bowels free, and avoiding excitement of all kinds, bodily or mental, with a cool dressing, and supporting the testicles with a suspensory bandage, is almost all that can be done; and that not of much benefit. Usually after a time it is outgrown, and the disposition to it ceases.—J. F. S.]

1535. The causes of varicocele are various, though in some cases often not at all determinable. For the most part it depends on weakness of the spermatic veins, produced by great congestion, in consequence of venereal excesses, onanism, or from long-continued libidinous appetite, or after previous inflammation of the testicle, from obstructed return of the blood in persons of sedentary habits, in swellings and costiveness of the bowels, from a truss pressing the spermatic cord, from particular employments, and so on. The disease occurs more frequently on the left than on the right side, the ground of which is to be sought for in various causes (1). Sometimes it is accompanied with hæmorrhoidal inconvenience. The disease is most commonly noticed in young persons, from fifteen to thirty years of age, rarely in older people. In many cases, however, the ætiology of this disease is quite obscure, and it is

(*a*) Observations et Réflexions sur la Fistule spermatique ou Spermatocèle; in Journal général de Médecine, 1826, June, p. 348.

indeterminable what share the above-mentioned causes have on its origin. The complaint often remains in a slight degree stationary, although, on account of the mode of living and employment of the patient, its increase is on every ground to be feared (*a*).

(1) Many derive this disease from pressure of the sigmoid flexure of the *colon* on the vessels of the spermatic cord. Morgagni and A. Cooper place the cause in the entrance of the spermatic vein of the right side into the *vena cava ascendens*, in an almost parallel direction with that vessel, whereby its emptying is more readily effected; whilst the vein on the left side terminating in the emulgent vein, the circulation produces an obstacle, as the two streams do not take the same direction. The length of the veins of the spermatic cord, on the left side, has also been charged with it, as well as the narrowing of the mouth of the left inguinal canal, in consequence of the contraction of the abdominal muscles, in the exertion of raising weights, on account of the bending over to the right side (Lenoir.)

1536. If the disease be left to enlarge, it changes the structure of the testicle by overspreading it, rendering it useless for its function, or atrophic: by the enlargement of the swelling are produced swellings of the veins of the purse, inconvenience from its weight, and not unfrequently considerable pain, especially on long-continued standing, or any over-exertion, and even the impossibility of walking without a suspender. In general there is also a greater secretion of the scrotal skin. Where a quick course of the disease, with violent pain and speedy wasting of the testicle have been observed, (Pott, A. Cooper,) it appears to depend less on the varicocele than on another and indeed traumatic influence.

1537. The *treatment* of varicocele must principally depend on its cause, and when this is known, it must be removed according to the general rules laid down. In a trifling degree of the disease, the purse may be supported by means of a well-fitting suspender; and by the repeated use, during the day, of cold astringent applications of lead wash, solution of alum, aromatic decoctions, frequent washings with these remedies, or with cold water and spirits of wine, or with *liq. mineralis* Hoffm., naphtha, and so on; even blisters may be applied to the purse to increase the contractility of the part. The patient must at the same time avoid all exertion, constant standing, and walking; and especially he must properly regulate his living. In most cases, however, the inconvenience of the patient is only lessened, and a check given to the progress of the disease.

1538. In the more advanced state of varicocele, if it cause considerable inconvenience or be connected with rupture, various modes of treatment have been proposed with a view to the radical cure, as extirpation of the varicose vessels, tying all (1), or a single bundle of the swollen veins (2), tying the spermatic artery (3), carrying through threads or needles, or a simultaneous surrounding of the latter with threads (4), excision of a part of the purse or its inclusion in a ring (5), the ensheathing of the skin of the purse (6), and the continuance of pressure by means of a compressor or a pair of forceps (7).

(1) According to Celsus the superficial veins were cauterized with a pointed iron, and the whole bundle of deep veins tied and extirpated. In the same way have Paré Heister, Petit, Cumano, Key, and others, proceeded with some modification, in which they have only removed the veins, or even the testicle itself.

(2) Charles Bell considered the separate tying of one or more venous strings suffi-

(*a*) Delpech, Précis élémentaire, vol. iii. p. 266.

cient. The veins are to be laid bare by a longitudinal cut through the skin and general scrotal covering, one of the largest venous strings grasped with the fingers, separated and tied with a thread. When this disease is very large, two and even three strings must be tied; and the wound closed. The ligatures separate in a few days.

Delpech (*a*) divides the skin by a cut of two inches long, parallel to the spermatic cord, cuts through the *m. cremaster* and sheath with the forceps and bistoury, raises one vein from the rest, isolates it, passes under each a piece of thick soft German tinder, and then puts a single ligature on the latter. The ligature is only to be drawn so as merely to bring the walls of the vein together, and prevent the flow of blood through it; whereupon great swelling of the varicose vein ensues. The wound is to be lightly filled with lint and covered with a softening poultice. The ligature is to be removed on the third day. Delpech has noticed, after the performance of this operation, the restoration of the function of the testicle.

Tavignot's subcutaneous ligature in the way already mentioned. (*par.* 1432.)

(3) Maunoir, (*b*) Brown, (*c*), Amussat (*d*) and Jameson (*e*), have tied the spermatic artery successfully, but, Graefe (*f*) without success. According to Maunoir, the cut should be made half an inch long, below the abdominal ring in the course of the cord, its sheath opened, the artery separated, a double ligature applied, and the vessel divided between them. If the varicocele exist in such a degree that simultaneous loosening of the spermatic cord and testicle expand the *scrotum* to a large swelling, this proceeding is more difficult, and it would be better to make, close above the external abdominal ring, a cut two inches long, obliquely upwards and outwards, to cut through the outer walls of the inguinal canal, to open the sheath of the exposed spermatic cord with a shallow incision, and carefully to separate the artery. In this case it must not be overlooked that the spermatic artery also divides below the external ring (*g*).

(4) According to Fricke a part of the purse should be grasped with the left hand, so that one of the expanded veins may be found between the fingers, upon which with a common needle the skin and vein are to be pierced obliquely, and a thread introduced which is to be tied upon the skin. This operation, which may be repeated on one or two other veins, is easily performed and little painful. The purse should be kept horizontal and supported on a pillow. If, on the next day, redness of the skin and sensibility of the testicle occur, the thread is to be withdrawn. The swelling gradually subsides, and the veins are converted into solid strings, free from pain.

According to Kuh (*h*) every single vein of the *plexus*, on both sides of the purse, is to be grasped with the fingers and perforated with a needle, each needle to be ensheathed in a proper cork, and the purse supported with compresses or a suspender.

According to Davat and Franc (*i*), the varicose veins should be separated from the *vas deferens*, and one or two needles thrust between them; a waxed thread is to be twisted several times round such needles, and tied fast, by which the vein is constricted and obliterated. Franc believes that two days, and even a shorter period, is sufficient to produce complete obliteration of the vein. Raynaud's practice (*j*) agrees with this, but that he applies a linen cylinder on the skin, upon which he ties the threads together; by tightly tying, he divides the spermatic cord till the skin alone remains undivided, which after the ligature has been drawn out, is divided upon a director, and the superficial wound heals quickly afterwards.

(5) Wormald (*k*) passed the lower part of the purse through a soft, wide silver ring, an inch in diameter, and covered with leather whilst the patient reclined, and the veins were empty, and fastened it so tightly together that the parts could not escape. This was done every morning, whereby inconvenience was avoided. A.

(*a*) Mémorial des Hôpitaux du Midi, 1830.—Journal von Graefe u. Walther, vol. xvii. p. 329.

(*b*) Nouvelle Méthods de traiter le Sarcocèle, sans avoir recours à l'extirpation du testicule, etc. Genève, 1820—Journal von Graefe und Walther, vol. iii. p. 369.

(*c*) New York Medical and Phys. Journal, 1824, March.

(*d*) La Clinique des Hôpitaux, vol. iii. No. 82.

(*e*) Medical Recorder, 1825, April, p. 271.

(*f*) Klinischer Jahresbericht, 1822.

(*g*) Dietrich, above cited, p. 448,

(*h*) Above cited, p. 58.

(*i*) Above cited.

(*j*) Gazette Médicale, Dec. 1837.—Froriep's, N. Notizen, Febr. 1839. No. 99.

(*k*) London Medical Gazette, 1838, April.

Cooper (*a*) objects to this proceeding, and recommends cutting off a sufficiently large flap of skin from the purse, after which the suture is to be so applied that the lower flaps of the wound should support the testicle like a suspender. By this means the varicocele is diminished, though not removed, but all inconvenience is got rid of.

(6) In a similar manner the ensheathing and shortening of the purse, proposed by Lehmann (*b*), acts. The whole of the front of the purse is thrust up with the forefinger of the left hand, so high beneath the skin of the belly, till the bottom of the purse is brought above the horizontal branch of the share-bone, and the testicle lies pretty close to the belly. Gerdy's rupture-needle, armed with a double thread, is then introduced into the bottom of the ensheathed canal, the purse, and the overlying skin of the belly, penetrated with its point, so that the eye with the threads may project some lines. With the assistance of a pin, the end of one thread is to be freed from the eye and the needle being drawn back, is then thrust through again in the same way, half an inch deeper, and the other end of the thread pulled out. The ensheathed skin is drawn with the thread loop so close to the belly, that the testicle lies hard by it. The two ends of one thread are then tied upon a wooden cylinder, as big as a crow quill, about an inch and a half long, and covered with sticking plaster; and afterwards the other.

(7) Breschet (*c*) has proposed a simple and certain mode for employing compressors, both for the swollen veins of the purse, and also for those of the spermatic cord; and from his practice are, to a certain extent, those of a recent date derived.

Compare also Landouzy, above cited.—Rognetta; in Bulletin de Thérapeutic, vol. vii. pt. i.

1539. Of these various modes of treatment for the radical cure of varicocele, both according to my own and other's experience, that proposed by Breschet as regards its easy employment, its applicability to the different stages of the disease, its certainty, and its freedom from danger, is to be esteemed the most proper and the most preferable. Extirpation of the testicle, and tying the whole bundle of veins, can bear no comparison with it. Tying the separate veins as proposed by Bell, has not been supported either by others' or by my own experience; and Bell himself subsequently did not advise it (*d*). Tying the spermatic artery is very difficult, often scarcely possible, on account of its intimate connexion with the other tissues of the cord, without injuring them, and on account of the variety of its ramifications uncertain in its result. Piercing the veins with needles or threads often risks the danger of inflammation and has uncertain success. The introduction of one or several threads, or of a single thread below the bundle of veins, may also produce severe symptoms, is more tedious, more painful, and consequently less favourable than the practice of Breschet (*e*). The drawing into a ring, and cutting off flaps of the scrotal skin, are merely palliative.

1540. In order to include all the veins, in the operation after Breschet's method, the patient must walk about for some hours previously in summer, and in winter keep in a very warm bed, by which the veins are filled with blood. The purse is to be shaved, and the patient placed in front of the operator, who with his left hand grasps the right side of the purse, with the fore and middle finger behind, and the thumb in front, with its tip on the *septum*, whilst the two fingers support the testicle; the finger of the right hand is to be applied to the left side of the purse, so that the fingers may touch. The *vas deferens* is now to be found, which

(*a*) Guy's Hopital Reports, 1838, p. 9.
(*b*) Pr. Vereinszeitung, 1840, No. 49, 50.
(*c*) Mémoire sur une nouvelle Méthode de traiter et de guérir le Cirsocèle, et le Varicocèle, lu à l'Académie def Sciences le 13 Janvier, 1834.
(*d*) Bell, Charles, vol. i. p. 95.
(*e*) Dufresse, above cited.—Landouzy.

is easily done, in consequence of its position at the back of the cord, its string-like character, its equal thickness (that of a crow quill,) throughout, its hardness but elasticity, and by its peculiar painfulness when pressed. The *vas deferens* is now to be kept back with the finger and thumb against the *septum*, whilst the veins are drawn out from it with the same fingers of the right hand, in doing which especial care must be taken that not a single vein remain with the *vas deferens*. The *penis* is to be kept by an assistant lying upwards upon the belly, for the purpose of preserving on its under surface a sufficient length of skin, so as to prevent painful distention in the often recurring erections. The compressing forceps are then to be applied, first the upper as high as possible on the purse, though at sufficient distance from the *penis* as not to produce excoriation; the under one half an inch below the first, without, however, touching the testicle. The forceps are applied so across, that their arms grasp nearly the whole breadth of the left side of the purse, up to the *septum*, that the *vas deferens* remains unenclosed, and only the outer edge of the purse, to the breadth of from two to three lines, without the veins, is contained in the space between the arms of the forceps, and when they are closed is not squeezed. The arms of the forceps are now closed as tightly as possible with a screw, then by means of more violent pressure on a narrower space, a concealed plate on the upper arm is pushed forwards next the screw on the *septum*, and then that on the other arm screwed tight. The patient is then put to bed, the forceps kept against the belly by long strips of sticking plaster, and the purse supported with a cloth or with a ball of lint.

The same method serves for the left side, on which varicocele is most frequent, as that described for the right side, only the position of the hands is reversed.

For the above described compressing forceps, and their mode of application, see Landouzy, f. 1, 2, 3. Breschet's original forceps, their improvement by a moveable plate, to effect pressure on three sides. I have employed the latter always with the best result.

1541. In the first hours after the operation, the patient feels a sharp pain in the purse and in the groin, but this subsides. Applications of lead-wash are to be made to the purse. When on the second or third day the forceps become loose, the plate is to be screwed tighter, which, if it be now only as at first properly done, does not cause much pain. When suppuration ensues, between the fifth and sixth days, the forceps are to be removed, and the remaining suppurating parts treated simply. If painful erections of the *penis* take place, which are most surely prevented by keeping the *penis* against the belly during the application of the forceps and subsequently, which I have never practised in my operations, small doses of camphor, with nitre, may be employed. The time necessary for the cure varies between three and six weeks. It is advisable, for some months after the cure, to wear a well-fitting suspender, and to use the cold bath and lead-washes.

III.—OF HÆMORRHOIDS OR PILES.

Hæmorrhoids, Lat.; *Hæmorrhoidalgeschwülste*, Germ.; *Hémorrhoides*, Fr.

Theden, Chirurgische Wahrnehmungen, vol. i. p. 56.
Richter, Anfangsgründe, vol. vi. p. 393.
Abernethy, Surgical Works, vol. ii. p. 231. New Edition. 1815.
Kirby, J., Observations on the Treatment of certain severe forms of Hæmorrhoidal Excrescence. Dublin, 1825. 8vo.
Copeland, T., Observations on the principal Diseases of the Rectum and Anus. London, 1814. 8vo.
Whyte, W., Observations on Strictures of the Rectum and other Affections, etc. Third Edit. Bath, 1820. 8vo.
Howship, J., Practical Observations on the symptoms, discrimination, and treatment of the most common Diseases of the Lower Intestines and Anus, etc. London, 1820. 8vo.
Dupuytren, De l'Excision des Bourrelets Hémorrhoidaux; in Leçons Orales de Chirurgie Clinique, vol. i. p. 339.
[Physick, The double canula and wire recommended in the operation for Hæmorrhoidal Tumours; in Philadelphia Journal of Medical and Physical Sciences, vol. 1. p. 17. 1820.
Smith, N. R., On the Pathology and Treatment of Hæmorrhoidal Tumours, in North American Archives of Med. and Surg. Sciences, vol. 2. 1835.—G. W. N.]
Brodie, Sir Benjamin, On Hæmorrhoids; in London Medical Gazette, vol. xv., 1835.
Bushe, George, M. D., A Treatise on the Malformations, Injuries, and Diseases of the Rectum and Anus. New York, 1837. 8vo.
Syme, James, On the Diseases of the Rectum. Edinburg, 1838. 8vo.
[Watson, John, On the Pathology and Treatment of Hæmorrhoids in N. Y. Journ. of Med. for July, 1844.—G. W. N.]

1542. *Hæmorrhoids* or *Piles* are varicose expansions of the veins in the lower part of the *rectum*, in which, by the collection of blood in these vessels, unnatural bags and sacs of different size, from that of a pea to that of a walnut, are produced. These swellings are commonly called *blind piles*, (*Hæmorrhoides cæcæ*,) to distinguish them from *flowing piles* (*Hæmorrhoides fluentes*, *apertæ*;) they swell periodically, and again become lax, so that only the empty bags remain. If they have considerable size, they are called *sac piles* (*Hæmorrhoides saccatæ*;) if small, *tubercular piles* (*Tubercula hæmorrhoidalia*.) The blood coagulates in the sacs often into a hard mass, so that a firm swelling is formed.

Only when these swellings are not very large, may they be formed simply by expansion of the walls of the veins; but if they be of greater size, the blood is poured out beneath the inner coat of the *rectum*, and expands it into a sac; hence the large size which the swellings often attain. It often happens that in cutting them off little or no bleeding occurs, and it is then distinctly perceived that they consist only of skin. They have also frequently a peculiar form, which *varix* cannot so easily acquire. This is proved, especially by Kirby's careful observations, viz., that these excrescences do not consist of expanded veins, but of a sac-like lengthening of the thickened cellular tissue, surrounded with some veins, and covered with the integuments of the folded margin of the *anus*. The veins are branches of the internal *iliac*. In every case of internal piles the structure was the same, but the veins appeared wider, and were branches of the hæmorrhoidal vein. Brodie, on the contrary, asserts that in all cases he found the hæmorrhoidal knots only as expanded veins. In those of larger size more indeed than simple expansion of the veins is found, as there is effusion of lymph and thickening in the neighbourhood of the expanded vein.

1543. These swellings are often seated on the outer edge of the *anus*, or on the inside of the *rectum*, in the region of the *m. sphincter ani* or above it.

1544. The consequences resulting from piles are, *inflammation and suppuration, discharges of mucus* from the *rectum*, and *considerable bleeding*. If these swellings attain a large size, if, on going to stool, the piles within the *rectum* be protruded, they are often grasped by the aperture of the *anus*, swell considerably, are protuberant, and very painful. The pain often spreads over the whole belly, and the patient feels extremely painful *tenesmus;* the piles even become gangrenous. If they go on to suppuration, in which case syphilitic causes are mostly in play, suppuration may easily spread into the loose cellular tissue of the *rectum*, producing great destruction and fistula. Not unfrequently do these piles become converted into a hard fleshy mass, and even into cancer.

[Bushe has detailed an awful account of the symptoms of piles, most of which, however, result from the constitutional excitement they produce when inflamed, and are then occasionally very severe. The local symptoms are well described by him:—"A feeling of weight in the loins, hips, and groins; dull throbbing pain in the *rectum*, attended with a sense of increasing heat, *tenesmus*, mucous discharge, and occasionally darting sensations, resembling those of electricity; itching of the *anus*, and finally painful, difficult, and frequent micturition."—(p. 146.)

"Frequently the loss of even a small quantity of blood," observes Bushe, "relieves the feeling of weight and tension in the *perinæum*, *rectum*, and lower part of the back, as well as any other disagreeable symptoms which may have existed. The amount of hæmorrhage, however, is not always in proportion to the severity of the symptoms denoting the loaded state of the hæmorrhoidal vessels—the quantity being sometimes very great, though not preceded by well-marked premonitory signs; while, in other cases, the discharge of blood is trifling, notwithstanding the fluxionary movement may have been well marked. Generally it ceases after a few days; yet not unfrequently it continues for months. In some instances it occurs but once in life; again, it may return in the course of a few weeks, months, or even years. Occasionally it assumes a periodical character, returning with the season or month. The amount of blood lost varies; a drachm, an ounce, or even a pint may be discharged at a time, though it must be confessed, that the admixture of other fluids is apt to impose, upon the inexperienced, the belief that the loss of blood is much greater than it really is."—(pp. 146, 147.)]

1445. The *causes* of hæmorrhoid, besides predisposition, which is ascribed, to walking upright, to the difficult flow of the blood into the portal system, which is unprovided with valves, to hereditary habit, and to the flow of blood into the abdominal organs in advanced old age, are stoppages and costiveness of the intestines, much sitting, pressure of the pregnant womb, local irritation of the *rectum* from hard stools and continual riding, or of the neighbouring parts; for instance, of the bladder in urinary stone, and so on.

1546. The *treatment* of hæmorrhoids is various, according to the circumstances in which they are found. If they be inflamed, cooling remedies must be employed, cream of tartar with sulphur, leeches to the *perinæum*, cold applications; and if these cannot be borne, mild ointment and soothing fomentations. If the inflammation result from strangulation of the piles, their return must be attempted with the finger oiled, the patient being placed with his rump raised high, and all pressure removed; and if this be not easily effected, to empty them with a simple lancet cut. If they suppurate, the abscess must be soon opened to prevent burrowing of the pus, and if the ulceration depend on a syphilitic affection, the

proper local and general remedies must be employed. If the bleeding from the hæmorrhoidal vessels be very severe, so that the patient is much weakened or his life endangered, rest and the horizontal position, best on a hard mattress, is to be recommended; internally, milfoil or other astringent remedies; externally, cold hip-baths, cold water with vinegar or spirits of wine, cold decoctions of astringent vegetables, or solution of alum and the like, may be employed as injections into the *rectum*, or as fomentations with a sponge. If these means be not of use, and the danger pressing, the bleeding must be stopped by plugging in the way described (*par.* 934.)

1547. If the piles produce by their size or hardening constant inconvenience, bloody, mucous, or purulent discharges exhausting the patient's powers, continual pain, and the like, if they be external to the *rectum*, or project at every time of going to stool, and prevent the discharge of the motions, their removal is indicated. It is, however, to be remembered, that after the destruction of the piles by the reflection of inflammation upon the other veins, their tone is raised, and thus in part the cause of the hæmorrhoids is removed. Where, however, they are a healthy habitual emptying, or when they have causal relations with incurable diseases, as, for example, *phthisis pulmonalis*, we must be cautious with their removal; it must either be not undertaken at all, or, at least, all the piles must not be removed at once.

1548. Extirpation of the hæmorrhoids has been proposed in three different ways. *First.* A ligature to be applied around the base of the whole swelling, and this gradually, and not at once, tightened, till the knots have fallen off (1). *Second.* The external skin of the pile is to be divided with a cut down to its base, and separated on both sides from the under-lying skin, which is to be cut off with scissors. The advantage of this practice is, that the remaining external skin covers the seat of the vein, and prevents the bleeding. *Third.* The pile is to be grasped with the forceps, drawn forwards and cut off with scissors in such way that some still remains on the base, by which the wound is partially covered. In external hæmorrhoids, the cut is to be made in the parts below the *sphincter*. The entire surface of the wound retracts into the *rectum*, and by the action of the *sphincter* is contracted, whence the danger of bleeding is very much diminished. If the wound be retracted above the *sphincter*, internal bleeding may take place. This practice is easy, and preferable to the others, as after the ligature there is often severe pain, inflammation, vomiting, retention of urine, and so on; as the division of the external, and the extraction of the internal skin, is always difficult, and in many cases, on account of their union, impossible. The large hæmorrhoids, also, are mostly formed by effusion of blood beneath the internal coat of the *rectum*.

(1) Rousseau, J. C. (*a*), passes a needle with two threads of *different colours*, from the *anus* outwards, through the swelling; then two-thirds of an inch farther back again from without to the *anus*, thus leaving between the stitches a loop of three or four inches long, and thus carries it around the whole swelling. He then cuts through the loop of the one colour to the outer, and that of the other on the inner side towards the *anus*. In this way is each part of the swelling surrounded with a ligature, which is to be drawn tight, and cut off short. If the swelling be large, the

(*a*) American Medical Recorder, vol. ix. p. 282.

dead part, when it has become insensible, is to be removed, but not too close to the ligature. The ligatures usually fall off in seven or eight days.

Delpech (*a*) divided with a single cut the fibres of the *sphincter* muscle towards the *coccyx*, introduced a pessary, and let it be drawn with a string attached to it by an assistant, by which the swelling was reversed and cut off with a scalpel, but was then introduced, the string carried through the opening of another pessary, and tied upon a piece of wood so as to compress the *anus* between the two pessaries.

[Copeland and Brodie lay down as a general rule that internal piles should be removed by ligature. Bushe also prefers this mode, and says:—"I have now performed it, I am sure, upwards of a hundred times, and I have never seen a bad symptom follow it." (p. 187.) And Syme observes:—"I feel warranted, after very extensive employment of ligature, to state, that it may be used without the slightest risk of serious or alarming inconvenience." (p. 76.) It must not, however, be forgotten that serious inconvenience and fatal results will, occasionally, follow the application of the ligature to piles. Petit (*b*) mentions the case of a woman in whom, under very favourable circumstances, he tied three piles, which at first did not cause much pain; but, five hours after, she was attacked with violent colicky symptoms, for which she was bled four times without benefit; the ligatures were then removed, the symptoms yielded, and the patient recovered. In another case related by Petit, five ligatures were applied at once, inflammation and swelling of the belly, vomiting and hiccough ensued; the ligatures were removed, but the patient died. And he observes:—"I compare these symptoms with those, accompanying a rupture, in which a small portion of intestine is strangulated; if this kind of rupture be not speedily relieved, the patients die, sometimes in thirty or forty hours, of gangrenous inflammation of the whole belly, but particularly of the intestines; thus this patient died before the conclusion of the second day." (p. 125.) Kirby mentions two similar cases, one of which was scarcely saved, and the other died of *tetanus*. Brodie relates two fatal cases after ligature, in one of which the the patient died, "in consequence of diffuse inflammation of the cellular membrane running up on the outside of the gut as high as the mesentery; but it was in a constitution broken down by long-continued hæmorrhage, and in whom any slight accident might have produced equally bad consequences." In the other case, the patient, "a week after the operation, and having been quite well in the interval, had an attack of pain in the *abdomen*, and shivering attended with fever, and died. An examination of the body not having been allowed, the precise cause of death was not ascertained." p. 844.

"The safest and best way," says Copeland, "is to pass a ligature round one only of the tumours at a time, the most painful and troublesome of them, and to wait until the patient has quite recovered from this operation before any thing more be attempted, if any thing more should be still necessary. * * * It is better that this operation by ligature should be repeated two or three times, if it should become necessary, than that the tumours should all be removed at once, at the imminent risk of the life of the patient." (pp. 64, 5.)

It is right that the day before the operation the patient's bowels should be cleared with castor oil or rhubarb, which prevents the necessity for disturbing them for a few days afterwards. Brodie recommends that the piles should be well protruded by sitting "over a pan of hot water, which will relax the *sphincter* muscle, and at the same time cause the veins of the *rectum* to become filled with blood. If this be not sufficient, let the patient have a pint or two of warm water thrown up as an enema, and when that comes away, the piles will probably descend. * * * Let the patient lean over a table, or lie on one side in bed, with his knees drawn up, the *nates* being held apart by an assistant. Each separate pile must be separately tied. If it be of a very small size, you may just take it up, with a double tenaculum, draw it out, and tie a ligature round its base. But if the piles be of large size, a large curved needle, armed with a strong double ligature, is to be introduced through the base of one of the piles, and the needle then cut off. The double ligature, is now divided into two single ones, which are tied round the base of the pile; one on one side, and the other on the other, with a single knot. * * * When each pile is thus secured, cut off the convex portion of each pile, so as to make an opening into

(*a*) Mémorial de la Clinique de Montpellier, 1830, Sept. p. 545.
(*b*) Œuvres Posthumes, vol. ii.

the cavity of the convoluted vein which forms it. Thus you take off the tension produced in the pile by the blood which it contains, and are enabled to draw the ligature tighter than before. It should be drawn as tight as possible; for then the subsequent pain will be less, and the separation of the slough quicker. A double knot having been made on each ligature, threads are to be cut off close to the knots, and the piles, and the remains of the ligatures returned into the *rectum*. In about a week the ligatures are generally detached; and at this period the bowels should be kept gently open with lenitive electuary and sulphur, and cold water be thrown up the *rectum* every morning, in order to prevent a recurrence of the disease." (p. 844.)]

1549. The extirpation of the large swellings, degenerated piles, is performed in the following way. After the bowels have been emptied by a purge, and shortly before the operation by a clyster, the patient is to be placed on his belly with his buttocks raised, or upon his knees and elbows, or upon the side, in which case the opposite thigh is to be drawn up towards the belly, and the buttocks separated by an assistant. In internal piles, the swelling having been protruded by the pressure and straining of the patient, also after the employment of a warm hip or vapour bath, is to be grasped with broad-bladed forceps drawn forwards, and the *projecting part* cut off at one or more strokes with curved scissors. In the same manner external hæmorrhoids are to be treated. The most important thing to be dreaded, after the operation is bleeding; often is it inconsiderable, stops of itself, or can be stanched with cold water. When it is more severe, it may be most certainly stanched by cauterizing the bleeding part with a bean-shaped iron. The patient must always at first be attended by an experienced assistant, as after-bleeding, especially if it be not cauterized, is always to be dreaded (1). After the removal of an internal pile, there may be imminent danger without it being noticed. The patient always feels an increased warmth in the *rectum*, which is accompanied with the symptoms of concealed bleeding. A cold clyster must be immediately given; by straining and forcing, the blood must be discharged, and the bleeding part protruded, upon which the hot iron is to be applied. The inflammatory and spasmodic symptoms, as fever, colic, retention of urine, and so on, which soon come on after the operation, especially if cauterization be employed; must be got rid of according to circumstances by blood-letting, fomentations to the belly, introduction of the catheter, and anti-spasmodics. After the removal of large hæmorrhoidal swellings, a moderately thick bougie, smeared with cerate, must be introduced from time to time, to prevent a narrowing of the *rectum* (2).

Plugging the *rectum* may, indeed, be employed for stanching the bleeding; inconveniences are, however, connected with it, especially the continual pressure, extremely tiresome to the patient. The plug is also easily displaced, and its effect is not so certain as that of the hot iron (*a*).

[(1) When the bleeding after the removal of internal piles is profuse, and the patient will not submit to the actual cautery, Bush advises the use of an instrument which he "had constructed for suppressing hæmorrhage after lithotomy. This instrument is seven inches long, tubular, about as thick as a swan's quill, terminated with a button at one end, to facilitate its introduction, and with a stop-cock at the other. One inch from the stop-cock, and half an inch from the button, there are two projecting rings, and on the proximal side of the distal ring the tube is perforated by a number of holes. Finally, a portion of intestine is bound by means of waxed silk on the tube, behind the ring. This instrument should be introduced, and then inflated. In some little time we can let off the air and withdraw the in-

(*a*) Dupuytren, above cited.

strument, provided the hæmorrhage has ceased; but if we find that it returns on the removal of the pressure, we must again inflate the intestine." (p. 185.)

(2) The elder CLINE was accustomed to cut off piles; and ASTLEY COOPER (*a*), for a time, followed the same practice, "thinking excision the best mode, because he found the pain produced by it very trifling as compared with the ligature." (p. 75.) But he met with several fatal cases from this method, which he very candidly mentions. In one case, "a very few days after removal of internal piles with the scissors, the patient complained of pain by the side of the *rectum*; an abscess formed under the *glutæus* muscle, which discharged abundantly; his constitution was already broken up, and he died in consequence of the discharge." In the second case he had removed internal piles, by excision, from a nobleman, without ill consequences; but, two years after, a similar operation having been performed on the same person, it was followed by frequent desire to go to stool, and four times he discharged a considerable quantity of blood. On examining, with a *speculum ani*, "one of the hæmorrhoidal arteries in the centre of one of the piles, which had been removed, was found divided." COOPER took it up; but the patient, being advanced in years and much weakened, was attacked with a severe rigor, grew gradually worse, and in four days died. The third case, operated on by another surgeon, died from bleeding, on the fourth day. In the fourth case mentioned by COOPER, there was not any hæmorrhage; but, three days after, the woman was attacked with peritonæal inflammation, and died ten days subsequent to the operation. On *opening* the body, the *peritonæum* was found much inflamed, and had the appearance of death from puerperal fever. (p. 75–7.) BRODIE employed excision for a time, but afterwards had three cases in which considerable quantities of blood were lost, and in the last, he observes, "so much, that he only wondered the patient did not actually die." Since then he has "never removed large internal piles except by ligature." (p. 843.)

(*a*) Lecture on Surgery; in Lancet, 1823, 24, vol. ii. Third Edition. 1826.

END OF VOL. II.

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